Aspects of Foreign Trade for Electrical Manufacturers and Jobbers—Shipping
Facilities—Duty—Drawback—Export Commercial Methods—Together with the Tariff Schedules

Electrical World

New York, October 28, 1916 McGraw Publishing Co., Inc. Vol. 68, No. 18 10c a copy

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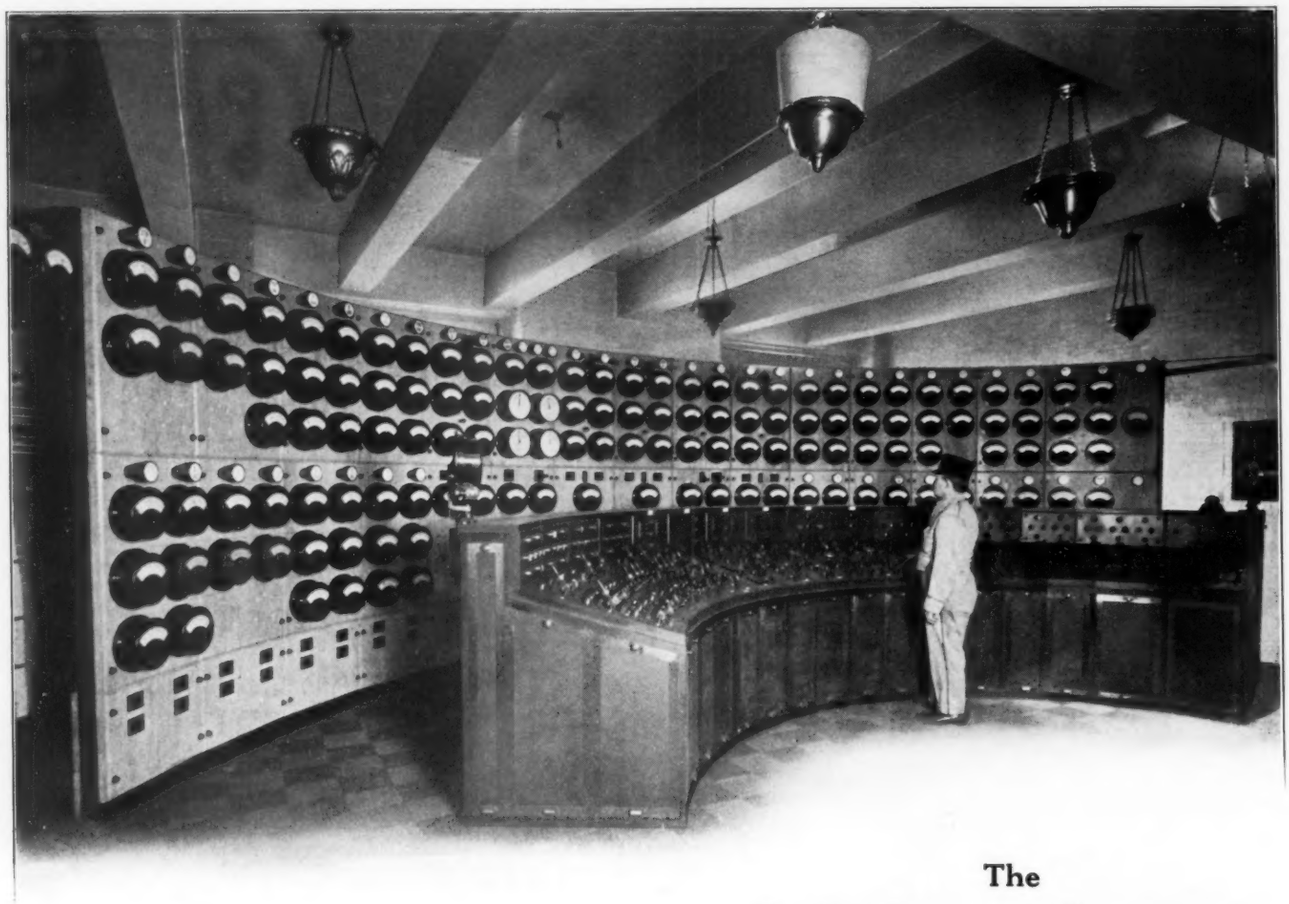

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Electrical World

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Complicated Rate Schedules

AN electric range salesman attempting recently to sell a range in a home already using electricity for other purposes was met with the statement from the lady of the house that she would be afraid to eat food cooked by so mysterious a force. Fortunately the average housewife is not so dubious about the success of the electric range, but to the lay mind there is altogether too much folderol about rate systems which are not only difficult to understand, but make the task of the salesman that much more difficult. A company which supplies electricity to more than 166,000 consumers, for instance, recently published a schedule of rates for electric cooking which quotes "4 cents per kilowatt-hour for the first 30 kw.-hr. of 'active connected load,'" and later explains that "the active connected load is 100 per cent of the first 2 kw. of installed capacity and 50 per cent of the connected load installed in excess of 2 kw." The company's own agents despair of getting the average housewife to comprehend this fully. With the strenuous efforts now being made, not only to electrify the home but to develop all manner of load on the farm and in the shop, might it not be well to give a little more attention to plans for simplifying rate schedules also?

Localizing National Activities

THERE is a decided tendency in our national organizations to strengthen local sections and so to make more definite the work of the national bodies outside of headquarters. This month an important meeting of the American Institute of Electrical Engineers was held in Philadelphia with an executive meeting of the board of managers. Some misgivings were expressed about a meeting of Institute managers outside of New York being well attended; but none now exists. Another great body, the National Electric Light Association has also made plans to emphasize the activities of its geographical sections and so give local expression to the constructive work which that society is doing and has done. Another evidence of this same tendency, though perhaps expressed at present with less definiteness, is the formation of composite local organizations of civil, electrical and mechanical engineers to express what may be called the engineering sentiment of the community on municipal questions which are more engineering than political in nature. In some cities, notably Chicago, the younger engineers have bonded themselves together and expressed common purposes. Other communities, such as Cleveland, have given local expression to general movements through electrical leagues, embracing representatives of all branches of the electrical industry in the community. This tendency to deepen as well as to broaden the local work of the national associations is a sign of healthy growth and should be fostered. New York's traditions, Chicago's energy, San Francisco's optimism together should express our national outlook and not one of these alone. We should therefore make our activities truly national by bringing to the work the inspiration of direct viewpoints of local as well as so-called national centers of influence.

Progress in the Gas Standard

IN some companies which furnish both electricity and gas it is the custom in one of these branches of service to refer to the other, not specifically by name, but as "another form of illuminant." This phrase will need revision if the commissions continue to authorize gas companies to use a heating unit instead of a lighting unit as the standard. An order of the New York Public Service Commission, Second District, was issued this week approving the new standard for large companies. It follows somewhat closely the earlier action of the Wisconsin and Massachusetts commissions. As the movement of the gas companies is in only its early stages, further advances will undoubtedly follow steadily in the application of their product for industrial purposes. Whether the ultimate result is to be keener competition or a closer co-ordination of the functions of electric and gas service, the coming developments will be anticipated with alert interest.

Getting the Farm Business

EACH year more people use electricity, because more radiating transmission lines bring homes and factories within reach of central station circuits. The desire for electric service by those not within reach of such circuits has led to the development of home and farm lighting outfits. That these are expressive of public appreciation of the usefulness, convenience and safety of electricity goes without saying. Their relation to central station growth is perhaps a second significant feature. It is, of course, an accepted fact that economically, electrical energy supply is best furnished from central sources. It is not as well realized that distribution costs hold back development in sparsely-settled districts which must wait before they can get all the benefits of central station service. In this field there is a wide market for small generating sets, which bring to the farmer and the isolated suburbanite clean, safe lighting and a limited opportunity to use

small motor-operated devices and electrical cooking appliances.

The technical problems involved in the development of these outfits offer an interesting field for speculation. The generators in the sets on the market are usually low-voltage machines. This means special motors, lamps and devices. In many cases it also means special wiring. With these several factors in mind comes also the question of marketing and installing the sets. One large distributer has issued a farmers' handbook on electricity in which the suggestion is made that the farmer have the nearest electrical contractor wire his house and that the wiring be up to standard underwriters' requirements for the ordinary voltage of central station distribution. This is sound advice. The industry must look ahead and see that these farmer customers are so educated to the advantages of electricity that the lesson will stick. We are believers in what might be called the "light-every-home movement"; but if such a movement is to react finally to the best interests of the customer the electrical trade must be a part of it, and the farmer should not get a bad start with inadequate wiring or toy horsepower.

Struggling Against Higher Costs

PRESENT costs of materials and labor in the electrical industry force conjectures about the future. They appall the conservative operator, they cause hesitation even with the buyer who is temperamentally inclined to take a chance. Neither manufacturer nor user feels wholly comfortable over the uncertainties of 1917 and 1918 prices. If one can readily adjust the prices of his products as his costs fluctuate the outlook, is, of course, less serious than in those cases where prices are definitely fixed. But while the manufacturer can alter his schedule for the consumers of his products he is, at the first stage in his processes, a consumer of raw materials and a buyer of labor; and if he buys less advantageously than his competitor he is handicapped. With the central station manager any effort to recoup extra costs from the consumers by means of higher rates is a step which it is difficult to take.

At the outset of the recent advances in raw materials the American manufacturer of electrical apparatus was confronted by grave problems in the resulting costs. He did not reach a solution of these problems wholly by the easy, simple means of making a horizontal increase in prices corresponding mathematically to the higher quotations on raw materials. He called in his designers and they got busy. By redesigning apparatus they made it possible, without lessening the efficiency of the manufactured product, to absorb part of the cost of raw materials. In some instances they substituted elements of labor cost for elements of raw material cost and thus contributed to the general desired result. To this kind of skillful work is due in part the fact that the rise of nearly 200 per cent in copper and the marked advances in other metals have not been incorporated in the full measure of their large size into all prices of electrical apparatus marketed by the manufacturer.

If the limit of the possibilities in redesigning is reached prices will naturally move upward with any further advances in raw products. There is not a unanimity of opinion in the industry as to whether prices have reached the high level, will go higher or will react. The query is interlaced with so many domestic and foreign issues that prediction is dangerous. But the problem of whether or not the entire industry is facing a permanently higher level of costs, or even a higher level for, say, two years more, merits the closest study of the best minds. For average costs of production and hence the rate-making influences of the period will have a large effect upon central station development.

Problems of the Small Plant

ELSEWHERE in this issue appears an article which described rather unusual commercial methods and results as worked out by a keen-witted woman manager for a typical small plant similar to scores to be found scattered through the rural districts of the country. The results obtained show how essential a knowledge of the habits and temper of the community, coupled with a disposition to meet them cheerfully, is to the well-being of an electrical supply company working in small towns. The system under consideration started with the development of a small water-power and its connection through a local distribution system, which had been giving night service only on a woefully abused flat rate. The first step was to drop the flat rate and meter the energy, a step into a quagmire of protest, as might have been expected. The regulation scale of prices hit the small consumer hard considering his previously acquired easy-going habits of wastefulness. After a brief period of contemplation a new optional rate was devised, characterized by a low-energy charge coupled with a minimum of $2 a month. At the rate set this $2 a month amounted to 34 kw.-hr., considered ample for small consumers. The arrangement was sufficiently liberal to quiet protests and at the same time it gave for large consumers using energy under the regular schedule the benefit of their higher consumption. Other questions involving rates and investments also presented themselves and were successfully disposed of as will be noted from a reading of the article in question.

One problem in particular was handled in thorough Yankee fashion. In this case the people of a village of some 500 inhabitants 14 miles away appealed for service and were determined to get it, with a persistency and alertness characteristic of the Middle West. The village to be benefited turned out with abundance of men and teams, and helped the construction gang in every way practicable, so that the three-phase transmission line was built at a cost of only $425 per mile. An additional $3,000 investment fitted up the local distribution system, and the first year's returns have already justified the investment. The results of these experiments in enterprise have fully justified the means, and set a good example for those who have to deal with electrical distribution on a small scale.

Lighting of an Art Museum

ILLUMINATION such as was worked out for the new Cleveland Museum of Art, as described in this issue, serves as a subject for profitable study. The work was fortunately placed in the hands of experts who were lucky both in the architectural situation and in the cordial co-operation of all those interested in the work. In this installation the end constantly in mind was not only to give the galleries the best natural lighting that could be secured, but also to make the lighting as nearly uniform as possible by day and by night, the former aim being accomplished by an ingenious method of natural light control. The general scheme of illumination is that found frequently in art galleries, of providing diffusing skylights in the ceilings receiving their illumination not directly but through the roof skylights above, chiefly by diffusion from the walls of the space between. Owing to the variations of light with the passage of the sun and varying daylight conditions it is usual to provide means for modifying the intensity of the available light. In the Cleveland Museum the plan adopted seems to have been singularly successful.

At night illumination is obtained by a method again not unfamiliar in art galleries, of placing lighting units in reflectors above the lower skylight, cross firing, so to speak, over the axis of the skylight so as to throw the light well on the walls. Advantage has been taken of the development of so-called "daylight" incandescent lamps, these being used throughout the installation in special reflectors somewhat hooded to prevent too much downward glare. The bulbs themselves, still further to screen the light, were slightly etched. The necessity for the addition of the hoods on the lower rim of the reflectors emphasizes what is a really vital need of illuminating engineering, a supply of commercial reflectors considerably deeper than those in common use, so as better to conceal the source and to direct the light in a somewhat narrower angle than is otherwise available in a diffusing unit.

The engineers were fortunate in dealing with a building architecturally well suited to the requirements of the case, instead of being forced into the use of lamps placed below the ceiling of the galleries themselves. Another ingenious scheme applied to the garden court accomplished a pleasing effect by paneled lantern units with carefully arranged distribution of light, the lanterns being equipped with daylight lamps. Still more striking is the plan devised for lighting the central fountain. The court is roofed in, and directly above the fountain is a projecting lens system supplied with light from above, and provided with a stop which can be focused to throw the light exactly upon the fountain area so that from a concealed source it is lighted as a definite and sharply outlined object. Altogether the feats accomplished represent a notable advance in the always difficult lighting of buildings of this class

Single-Phase Power Production

IN the early days of alternating-current generation and distribution, before the advent of the alternating-current motor, single-phase generators were the rule. At present, the polyphase generator is the rule and the single-phase generator the exception. The mechanical, electrical and economical superiorities of the polyphaser over the single-phaser are now too well known to evoke discussion. Occasionally, however, a large load presents itself, which is essentially single-phase, and which does not permit of being divided into three parts. Such a load tends seriously to unbalance the polyphase system to which it is applied. Within recent times the condition was met by installing a phase balancer set. Single-phase power production, especially through phase balancers, was very ably handled in a paper read by Messrs. E. F. W. Alexanderson and G. H. Hill at the recent meeting of the A.I.E.E. in Philadelphia.

In the direct-current three-wire distribution system, difficulties often present themselves, by reason of relatively large changes of load occurring on one side only of the system. This difficulty is frequently met by installing a rotating balancer set, capable of transferring half of the excess from the heavier loaded side to the lighter loaded side, the action being automatic and immediately effective within the limits of power covered by the balancer. The new rotating phase balancers offer a certain analogy to the old direct-current balancers, with the understanding that in the new alternating-current machines the transfer of load must be made from one phase to the other within the limits of each successive half cycle; whereas in the old direct-current machines the transfer was continuous. Moreover, when constructed in the synchronous type, they can be designed, without large extra cost, to serve also as rotary condensers for the automatic improvement of the power factor, as well as for the automatic improvement of the balance of the system.

The Coming Issues

NEXT week, in the public relations number of the ELECTRICAL WORLD for November, among other articles and features bearing upon public policy and executive management, an interesting discussion is planned on the reward of ably-managed public utilities by the principle of the London sliding scale. The use of special electric trucks in central station work is the subject of another timely article for the company executive. A test of the energy consumption required to heat a seven-room dwelling in a Pacific Coast city gives data on which to base a better understanding of the future of this house-heating field in localities where very cheap energy is available. In the station operating number, dated Nov. 11, a leading article will outline the developments in meter-testing methods and apparatus introduced by a Western operating company. Tests to determine the heating of underground high-voltage cables will be described in this number, which will also include the regular departments for the engineer and commercial man. Under date of Nov. 15 will be issued the fifth number of ELECTRICAL MERCHANDISING, the new monthly magazine of the electrical trade supplementing ELECTRICAL WORLD service.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

RATE CUT FOR ELECTRIC GARAGES

First Step in Chicago Demand Charge Reduced from 50 to 25 Kw.—Expected to Encourage Smaller Garages

Before a meeting of the Chicago Electrical Vehicle Section of the National Electric Light Association on Oct. 24, at which A. C. Downing of the Anderson Electric Car Company of Detroit was speaker of the day, George Jones of the Commonwealth Edison Company announced a reduction in rates for electrical garages. This is the second reduction within a year. In July, when a general rate reduction was announced, the electric garages were among the many who were benefited. The present reduction, however, applies only to the customer taking service on a limited hour schedule such as electric vehicle garages.

In the existing rate the demand charge is $1.40 per kilowatt for the first 50 kw. and 75 cents for each additional kilowatt demand. In the reduced rate soon to be effective, the demand charge is $1.40 per kilowatt for the first 25 kw., and 75 cents per kilowatt for the excess. No change is made in the energy rate.

This reduction will make a difference of about $18 a month in the bills of the larger garages. Moreover, the fact that the first step in the demand charge is reduced from 50 to 25 kw. is expected to encourage smaller garages.

In speaking of the past and present policies of electric vehicle manufacturers Mr. Downing said that five manufacturers had been accused of being selfish, of grasping in trying to make a profit on accessories and parts. Fortunately that condition no longer exists. The manufacturers now wish to assist everyone who has an interest in the electric vehicle.

IMPORTANT CHANGES IN JOVIAN CONSTITUTION

Dues Increased from $2 to $4 a Year and Co-operation with Society for Electrical Development, Inc., Assured—Chicago Degree Team Wins Cup

Practically all of two extraordinarily long sessions at the convention of the Jovian Order on Thursday, Oct. 19, was devoted to consideration of the constitutional revisions presented by the committee on Mercury's report. Oscar C. Turner of Chicago, the spokesman of this committee, recommended that the revised constitution be accepted. It was also recommended that the promotion committee be continued; that a new committee—a speakers' committee— be organized; that an insurance committee be appointed to decide upon accepting an insurance company's offer, which places at the refusal of members a special Jovian accident insurance policy at a low rate; and that committees on "railroad rate revision," on "terms and discounts" and on "civic co-operation" be appointed.

Four important features of the new constitution deal with dues, chartering local leagues, substitute for initiatory services, and the nomination of a complete regular ticket of candidates two months in advance of the convention date.

The discussion over increasing the dues from $2 to $4 a year was lively. A. M. Wilson of Cincinnati fought against any increase, declaring that it should be easier to operate the order now on $2 per annum than it was when the membership was small; that the official publication *The Jovian* should not be conducted at a loss; that members in arrears should be summarily dropped, and that the Order really does not need more money. He doubted also whether increased dues would mean increased funds, because the membership will necessarily decrease in numbers because of it.

OPERATING COSTS $3.08 PER MEMBER

Martin J. Wolf of St. Louis, in championing the increase in dues, stated that the expenses of operating the order are $3.08 per member while the dues are but $2. He also maintained that the work of the order was conducted economically and that *The Jovian* is cheap at any price. The Jovian Order as the sales force for co-operation must have funds to carry on its work, he said, and plans for a "100 point committee" whose duty it will be to sell the $4 dues idea to the entire membership would be formulated.

The measure failed to carry on the first ballot; but on a reconsideration of the question the increase was passed on the second ballot. Beginning with 1917 the yearly dues of the Jovian Order will, therefore, be $4 instead of $2.

On Friday only one business session was conducted. Three speakers addressed the delegates. They were: J. M. Wakeman and H. W. Alexander of New York, and W. A. Layman of St. Louis. The theme of Mr. Wakeman's talk was well summarized in his own statement that now and henceforth there will be no more competition between the Society for Electrical Development, Inc., and the Jovian Order than there is between the hands of a man swinging a sledge. This sort of co-operation, said he, will make these two orders the greatest trade influences in this country. Mr. Alexander explained the uses of the advertising and promotion work that is being done to stimulate interest in America's Electrical Week.

Mr. Layman made a scholarly address on "Building a Career," which will be printed, read in every Jovian League, and sent to every Jovian.

While the preparations for balloting for officers of the ensuing year were in progress Henry L. Doherty of New York, arrived. In a few words he expressed the belief that in the coming year the Jovian Order would do big things. He urged that care be exercised lest the slogans of the Jovians and the Society for Electrical Development, Inc., become merely empty sounds. He hoped that this year would see the establishment of an even higher *esprit de corps* among electrical interests.

CHICAGO WINS DEGREE TEAM CONTEST

The many enjoyable entertainment features of the convention were carried out in accordance with the program, with the exception of the automobile race, which was abandoned on account of the rain. The degree team contest was won by the Chicago team, and the cup was thus taken from St. Louis. The prize for the best individual character was awarded to H. S. Neill of Chicago. Lucky numbers in the automobile drawing were held by D. N. Elbert of Richmond, Ind., and Carson P. Harris of Indianapolis. In point of out-of-town attendance this

year's convention was said to be the best in the history of the order.

ELECTION OF OFFICERS

The election of officers resulted as follows: Jupiter, Henry L. Doherty, president Henry L. Doherty Company, New York City; Mercury, Ell C. Bennett, St. Louis, Mo.

MEMBERS OF THE CONGRESS

District	Congressman	Address
1	Edward F. Hail	Tel-Electric Company, Houston, Tex.
2	P. S. Klees	Franklin Electric Manufacturing Company, Hartford, Conn.
3	James R. Pollok	New York (N. Y.) Telephone Company.
4	William Gloeckner	V. V. Fittings Company, Philadelphia, Pa.
5	W. J. Trott	Fostoria Incandescent Lamp Company, Grand Rapids, Mich.
6	C. D. Cabaniss	Western Electric Company, Atlanta, Ga.
7	W. A. Burchard	William A. Burchard Company, Norfolk, Va.
8	J. E. Cowles	Shreveport (La.) Gas & Electric Company
9	Martin J. Wolf	W. N. Matthews & Brother, St. Louis, Mo.
10	E. W. Donoho	Landers, Frary & Clark Company, Chicago, Ill.
11	J. I. Colwell	Western Electric Company, Seattle, Wash.
12	John F. Greenwalt	Mountain States Telegraph & Telephone Company, Denver, Colo.
13	Thomas E. Collins	Pacific Electric Manufacturing Company, San Francisco, Cal.
14	P. T. Davies	Montreal (P. Q.) Light, Heat & Power Company
15	George L. Guy	Public Utilities Commission of Manitoba, Winnipeg, Manitoba

STATESMEN

State	Statesmen	Address
Alabama	H. W. Matthews	Burgoon-Matthews Electric Company, Birmingham
Arizona	None	
Arkansas	H. C. Couch	Arkansas Power Company, Arkadelphia
California	Murray Orrick	Western Electric Company, San Francisco
Colorado	A. F. Traver	Denver Gas & Electric Light Company
Connecticut	James T. Hessel	Hessel & Hoppen Electric Company, New Haven
Delaware	A. L. Fader	Newark Garage & Electric Company, Newark
Florida	H. R. Worthington	Florida Electric Company, Jacksonville
Georgia	Rawson Collier	Georgia Railway & Power Company, Atlanta
Idaho	Ernest C. Kierstad	Milner
Illinois	J. S. Corby	Bryan-Marsh Electric Works of the General Electric Company, Chicago
Indiana	R. Percy Oblinger	Indianapolis Electric Supply Company, Indianapolis
Iowa	B. H. Durbin	Bryan-Marsh Electric Works, Des Moines
Kansas	J. E. Taylor	Western Electric Company, Kansas City
Kentucky	Paul Tafel	H. C. Tafel Electric Company, Louisville
Louisiana	W. E. Clement	New Orleans Railway & Light Company
Maine	T. J. Brown	General Electric Company, Boston, Mass.
Maryland	C. Phillips Hill	Doubleday-Hill Electric Company, Washington, D. C.
Massachusetts	M. O. Troy	General Electric Company, Schenectady, N. Y.
Michigan	J. A. Cavanaugh	Benton Harbor-St. Joe Railway & Light Company, Benton Harbor
Minnesota	O. A. Rofelty	Minneapolis General Electric Company, Minneapolis. (North and South Dakota attached to Minnesota.)
Mississippi	W. F. Gorenflo	Gulfport & Mississippi Coast Traction Company, Gulfport
Missouri	A. P. Denton	Denton Engineering & Construction Company, Kansas City
Montana	None	
Nebraska	I. B. Zimmerman	Omaha Electric Light & Power Company, Omaha
Nevada	None	
New Hampshire	C. B. Burleigh	General Electric Company, Boston, Mass.
New Jersey	Herman C. Heidrich	Electric Repair & Motor Company, Newark
New York	H. E. Cleland	ELECTRICAL WORLD, New York City
North Carolina	A. V. Harrill	Southern Power Company, Winston-Salem
North Dakota	None	
Ohio	A. M. Wilson	University of Cincinnati, Cincinnati
Oklahoma	H. E. Musson	Telephone Gas & Electric Company, Okla.
Oregon	A. S. Moody	Pacific States Electric Company, Portland
Pennsylvania	C. L. Peirce	Hubbard & Company, Pittsburgh
Rhode Island	E. R. Davenport	Narragansett Electric Light Company, Providence
South Carolina	W. W. Fuller	Isle of Palms Traction Company, Charleston
South Dakota	None	
Tennessee	Frank Flournoy	Cumberland Telephone & Telegraph Company, Memphis
Texas	W. R. Phipps	Brush Electric Light Company, Galveston
Utah	Leo Brandenburger	O. H. Davidson Equipment Company, Salt Lake City.
Vermont	E. E. Larrabee	Twin State Gas & Electric Company, Bennington
Virginia	Guy E. Seiler	Virginia Railway & Power Company, Richmond
Washington	Carl Uhden	Washington Water Power Company, Spokane
West Virginia	W. R. Powers	Consolidated Heat, Light & Power Company, Huntington
Wisconsin	Walter B. Crabtree	Mechanical Appliance Company, Milwaukee
Wyoming	None	
Province of Alberta	Norman S. Richards	Northern Electric Company, Alberta
Province of British Columbia	Roy S. Davis	Davis-Hartney Company, Vancouver
Province of Ontario	J. H. Schumacher	Schumacher-Gray Company, Ltd., Winnipeg, Man.
Province of Quebec	E. N. Hyde	Northern Electric Company, Montreal

NEW ENGLAND PUBLIC RELATIONS SATISFACTORY

New Public Policy Committee's First Report Receives Wide Discussion at New England Section, N. E. L. A., Convention at Pittsfield

With a total registration of about 500, the New England Section of the National Electric Light Association convened last week at the Maplewood Hotel, Pittsfield, Mass., both weather and representative attendance making the gathering one of the best in the history of the organization. Following a dansant Tuesday evening, the regular business sessions opened Wednesday morning with President W. S. Wyman in the chair. The report of the secretary, Miss O. A. Bursiel, showed the section to have a total present membership of 1193, a gain of 21.9 per cent in the past year.

R. W. ROLLINS
President New England Section N. E. L. A.

From the headquarters' office at 149 Tremont Street, Boston, 18,000 pieces of mail matter were sent out in the past twelve months. Much effective work has been done by this office in the correction of false reports in the dailies of New England relative to fire causes involving electric wiring, many retractions having been published by the local newspapers in this section upon receipt of advices from the New England section disproving the alleged electrical causes of fires. The report of the treasurer showed a balance of $818 in the company's possession. The membership committee reported a prospective list of about 2410 for the coming year's endeavors.

Comprehensive plans for bettering public relations were outlined by Chairman E. S. Mansfield, of the advertising and publicity committee, and Eugene Carpenter, Newton, Mass., chairman of the educational committee. The sale of "large" power and industrial heating problems occupied the first day's sessions. Thursday's program included accounting, public policy and public service commission sessions, with addresses scheduled by prominent public utility commissioners, and a review of electric vehicle development. Friday was planned as a commercial day.

PUBLIC POLICY COMMITTEE FINDS CONDITIONS SATISFACTORY

The newly formed public policy committee presented its first report, R. W. Rollins of Worcester, Mass., being chairman. Generally satisfactory conditions were noted in the industry with respect to regulation, growth of business, and municipal operation. The report included a résumé of the development of the art of cen-

tral station supply and quoted data from the ELECTRICAL WORLD relative to the growth of the output and income of plants in the last three years. Favorable weather conditions, it was stated, have made the past eighteen months a banner period for the hydroelectric companies.

All the New England states now have commission regulation according to the committee, which was of the opinion that the restriction of the authority of the Massachusetts Gas and Electric Light Commission to the supervision of gas and electric light companies, water and hydroelectric companies is more advantageous than the plan followed in the other states of also placing transportation, communication and express companies under the jurisdiction of a single board. In New Hampshire and Connecticut municipal plants are exempt from commission control. The committee recommended that all plants of the same kind should make returns to the commissions.

Municipal operation of public utilities is never a dead issue. With the spread of socialistic ideas, there may at any time and place arise a demand for the municipal operation of any public utility; so it behooves central station managers to keep advised as to what is going on and to be prepared to show the public convincing facts.

In Massachusetts, in 1910, there were twenty-nine municipal electric plants and in 1915 there were thirty-nine. Less than one-half, however, operate generating stations, 55 per cent purchasing energy from private companies. The number buying energy has increased from eleven to twenty-two since 1911. In 1915 the income of the municipal electric plants in the state was $1,131,948 compared with $17,767,913 for the private companies.

Municipal competition, therefore, is not serious at present. All the municipal plants started in Massachusetts in the past five years are purchasing energy. All are reasonably near private plants, and the report questions the wisdom of private companies letting such business get under way in their immediate vicinity. The total capitalization of Massachusetts central stations increased from $42,818,616 in 1910 to $70,377,464 in 1915.

Discussion on Report

Herbert W. Moses, superintendent of the Welfare Bureau, Boston Edison company, said that the labor turnover of the company has gradually decreased in the four years of the bureau's work. There are now about 2000 employees, compared with 1400 four years ago. The relation between the number of additions to the pay-roll, the number of persons leaving the service and the total number hired is shown in the following table:

Year (fiscal)	Additional Employees	Employees Hired	Employees Leaving
1913	251	1,088	837
1914	178	1,047	869
1915	99	614	515
1916	83	763	680

The increase in 1916 is influenced by the country-wide demand for labor. In this year, 414 employees resigned and 266 were discharged.

T. C. Martin, executive secretary, N. E. L. A., New York, emphasized the great importance of reducing the labor turnover in striving to organize the industry upon an efficiency basis capable of securing the entire power load of the country instead of the present 25 per cent proportion.

W. H. Blood, of Stone & Webster, Boston, pointed out the need of lower insurance rates commensurate with improved standards of construction and operation. He urged local companies to procure schedules of "Deficiency Charges" from their underwriters' agents, and note the number of safeguards and rate-reducing provisions that can be introduced at nominal cost. Inspection bureaus will help if local companies cannot handle the problem by themselves. By this kind of analysis, the average rate has in late years been reduced in the Stone & Webster properties from $1.50 to $0.35 per hundred. Such points count, and not only where $80,000,000 of insurance is placed annually, as in the Stone & Webster organization. Small companies, he said, cannot safely carry their own liability insurance.

M. R. Griffeths, General Electric Company, said that safety work in the Schenectady factory has resulted in the following reductions in accidents from 1910 to 1915. Fatalities, five and one; lost time, 768 and 662 hours; time lost over two weeks, 238 and 191 hours; fractures, eighty-six and fifty; loss of eye, two and none; excisions, thirty-six and sixteen. The total number of employees increased from 8000 in 1910 to 19,000 in 1915. The total accident expense in 1915 was $30,000, the cost of accidents in the testing department being but $162.

A. B. Lisle, general manager, Narragansett Electric Lighting Company, Providence, R. I., said that by carrying its own liability insurance the company has saved $120,000 in the past five years. A reserve fund of $60,000 is now in hand. All claims are settled by an expert agent who gives about one-third of his time to the company, and a liberal policy is maintained. But one liability suit has been filed against the company in this period. Fire insurance, however, is carried with outside companies. Plans of new building construction are shown to the local insurance engineer before work is begun and many inexpensive savings are thus effected. A rate as low as 12 cents is obtained on a modern substation. Through attention to preventive work, the rate on the Providence property has been reduced from 60 to 18 cents per hundred in the past six years.

W. S. Wyman, Augusta, Me.; W. H. Snow, and C. R. Price, New Bedford, Mass.; C. L. Campbell, Waterbury, Conn.; F. J. Adams, Worcester, and A. D. Colvin, Hartford, Conn., also spoke briefly.

Commissioner Cleaves' Address

Chairman B. F. Cleaves of the Maine Public Utilities Commission then addressed the convention, emphasizing the importance of solving the problem of rural extensions in communities of less than 2500 population. He was of the opinion that the city customer should pay a slightly higher rate if this will enable the rural districts to enjoy the advantages of electricity. The commissioner stated that only about 1.5 per cent of the total hydroelectric resources of Maine are as yet utilized.

Officers for New York

The election of officers resulted in the following choice: President, Robert W. Rollins, president and general manager Worcester, Mass., Electric Light Company; vice-president, Arthur B. Lisle, Providence, R. I.; treasurer, Bowen Tufts, Boston, Mass.; secretary, Miss O. A. Bursiel, Boston, Mass.; executive committee, Maine, A. H. Ford, Portland; R. D. Smith, New Hampshire; Vermont, E. E. Larrabee; Massachusetts, Clifton R. Hayes; Rhode Island, S. B. Tuell; Connecticut, G. B. Leland.

Heat Instead of Illuminating Standard for New York Gas

The Public Service Commission for the Second District of New York has settled a problem which has been vexing it and the gas corporations in its jurisdiction for several years by making an order fixing heat units instead of candle-power as the standard of value for artificial gas. Hereafter gas must average 585 B.t.u. per cubic foot instead of 16, 18 or 20 cp. as heretofore.

With the universal substitution of electricity for lighting, the commission finds that gas is more and more being developed as an agency for cooking, heating power and other industrial and domestic purposes where heat value is of supreme importance and illuminating power of no consequence whatever.

CONTRACTORS' ASSOCIATION SEEKS PRICE PREFERENTIAL

Guaranteed Wiring, Unit Cost, Labor, Liability Insurance and Other Topics of Equal Importance Discussed by Officials at Recent Cleveland Meeting

At the sixteenth annual convention of the National Electrical Contractors' Association held in New York City last July, many subjects were brought up for discussion and reports of committees showed what the association has accomplished in placing electrical contracting on a higher plane and in adjusting unsatisfactory conditions in the trade. The work of the year was reviewed at a meeting of the executive committee held in Cleveland on Oct. 4 and 5, and plans were laid for

EXECUTIVE COMMITTEE OF NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION AT CLEVELAND

advancing the interests of the association and its members. Col. Robley S. Stearnes of New Orleans, president of the association, emphasized his belief in a price preferential for N.E.C.A. members in buying goods on the ground that they are entitled to a better price because they are part of the great buying power and are responsible and reliable. He also believes that the N.E.C.A. should have a trademark or emblem which will give its members preference over non-members. In order to stimulate interest in a membership campaign, Col. Stearnes has offered a loving cup to the person securing the greatest number of new members.

One of the most important N.E.C.A. committees is that on "cost data." This committee, which is now collecting information on unit cost of labor and material, has planned to have a national discussion on unit costs at the next annual convention of the association, which will be held in New Orleans in October, 1917. Harry C. Turnock of Cleveland is chairman of the committee.

Joseph A. Fowler, as chairman of the labor committee of the association, pointed out that labor on any contract, large or small, is a gamble, and that therefore the association should give to its members accurate information on the subject. Through an exclusive arrangement with an insurance company, the association has also been enabled to effect a saving for a large number of its members on liability insurance and workmen's compensation.

Paul H. Jaehnig of Newark, N. J., as chairman of the legislation committee is continuing his work of collecting laws and ordinances in various sections of the country so as to guide the association in its efforts for better electrical ordinances. Mr. Jaehnig expressed the belief that the National Electrical Contractors' Association should take active steps to bring about guaranteed wiring by the association for its members. W. C. Peet of New York City brought up the subject of estimates and said that electrical contractors should be protected in making estimates and bids so that a general contractor or house owner cannot use one contractor's price to lower the price of another. The same sentiment was expressed by J. T. Marron of Rock Island, Ill., who suggested in addition that electrical contractors should be paid for bidding on contracts. The electrical supply jobber was censured by M. G. Buchan of Cleveland, who said that by closing contracts directly a jobber is encroaching on the field of the electrical contractor.

There was quite some discussion on the relationship of the national association with other organizations, and it was the sense of the committee that there should be closer affiliation between national, state and local bodies, and that in order to become a member of the national organization it would be necessary for a contractor to be a member of both the state and local societies as well. The national association embraces in its membership more than 1100 contractors. George H. Duffield, 41 Martin Building, Utica, N. Y., is secretary.

CONVENTION SOUTHEASTERN SECTION OF N. E. L. A.

Fourth Annual Meeting of This Section to Be Held at Tampa, Fla., on Nov. 15, 16 and 17— Ten Interesting Papers Scheduled

An elaborate and interesting program has been prepared for the annual convention of the Southeastern Section of the N. E. L. A. which will be held this year at Tampa, Fla., on Nov. 15, 16 and 17. This is the fourth meeting of the organization since its expansion from the Georgia section to take in five Southern states, and the first to be held in Florida. The following papers have been scheduled:

"The Maintenance of Central Station Electrical Instruments," by F. M. Farmer, chief engineer of the Electrical Testing Laboratories, New York, N. Y.; "Advertising Electricity—Its Service and Applications," by J. C. McQuiston, advertising manager of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; "Accounting, an Essential of Management," by F. G. Whitney, auditor of Southern Utilities Company, Jacksonville, Fla.; "General Store and Window Lighting," by F. E. Lauderbach and Norman B. Hickox of the National X-Ray Reflector Company, Chicago, Ill.; "The Conservation and Direction of Human Energy," by J. H. Finney, general manager of the Aluminium Company of America, Washington, D. C.; "Heating Device Load," by Frank Hammond of the Birmingham (Ala.) Light & Power Company; "Up-to-Date Developments in Steam Turbine Designs," by M. B. Carroll of the General Electric Company, Lynn, Mass.; "Everyday Problems of Municipal Ownership," by Arthur Williams of the New York-Edison Company; "Notes on Grounding of Secondaries and Lightning Arresters," by E. P. Peck, superintendent of tests and repairs of

the Georgia Railway and Power Company, Atlanta, Ga.; "The Future Street Lamp," by W. P. Hurley of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

An enjoyable entertainment program has been arranged and all delegates are requested to bring their wives.

N. E. L. A. COMMITTEE MEETINGS

Winter Activities Opened with Large Number of Meetings at Atlantic City, New York, Chicago and Elsewhere

Beginning with a meeting of the motion-picture film committee of the Electric Vehicle Section on Oct. 6, National Electric Light Association committees have been meeting at the rate of almost one a day at Atlantic City, New York, Chicago or elsewhere. This is the start of the winter activities. The progress of these committees as reported to the different executive committees has been as follows:

Executive Committee Meeting

The executive committee of the association met at the New York offices on Oct. 13 at 10.30 a. m., President H. A. Wagner presiding.

The secretary and the treasurer read their reports. The total membership as of Aug. 31 was 15,066.

For the Commercial Section, Chairman Edkins reported that ten of the twelve standing committees had had meetings and are actively at work and that the other two have called meetings to be held in the near future. Three of the committees met at Atlantic City on the 11th and 12th of the month, and a joint meeting with the executive committee of the Technical and Hydro-Electric Section was also held for the purpose of discussing the cross-memberships of the two sections and matters of interest to both. Mr. Edkins stated that the commercial executive committee had voted to ask permission of the main executive committee to appoint a new committee on compensation of salesmen, adding that there is considerable demand for information on this subject and that the committee's report would undoubtedly be of great benefit to member companies. It is not intended to ask companies to divulge salaries, but rather to make a general inquiry to see whether it is possible to establish any fundamental principles or any general plans which could be adapted to the individual requirements of central stations.

Plan for Engineering Service Committee Abandoned

Mr. McClelland referred to the proposed plan of establishing a committee on engineering service for small companies, stating that investigation showed that this would involve so much time and resources that it was abandoned as impracticable. It was then proposed that it might be possible to have an information bureau, which plan would fit in very well with the data files. He added that in order to administer such a bureau effectively, the employment of a considerable force and a man acquainted with that sort of material would be necessary. It was voted that the committee will again authorize this work, with the understanding that the president will assure himself that there is no conflict with anything that the public policy committee contemplates to undertake. President Wagner appointed a committee consisting of Messrs. McClelland, Edkins and Lloyd to formulate a plan which will be referred to the public policy committee to ascertain whether it conflicts in any way with that committee's plans.

Chairman McClelland of the Technical Section reported that the work was well organized and well started, and that there would be no difficulty in getting the reports in by March 1. The technical committee, Mr. McClelland stated, is discussing the question of co-operation with the various committees of the A. I. E. E. and A. S. M. E., and possibly the Edison association, and a committee has been appointed to take this important matter under advisement with a view of eliminating as much duplication as possible.

The question of the Accounting Section approaching state commissions with a view to having them adopt the classification of accounts and the form of annual report was discussed, and it was decided that before approaching a commission the section should first determine whether the principal companies in the state desired to adopt the classification and form provided, they would be permitted to do so by the commission.

President Wagner authorized Chairman Bailey to proceed to appoint the personnel of the committee on accounting relations with other associations, bearing in mind the suggestions of the executive committee.

Mr. Bailey announced that the section considered it advisable to start correspondence courses on accounting, and with the approval of the executive committee desired to immediately begin on two courses, one fundamental and the other more advanced. It was planned to have the Chicago Central Station Institute prepare and distribute the lessons on the same terms that it handles the commercial section courses, the section committee on education receiving a lesson for criticism and revision before they are sent out. The section was authorized to proceed at once with the fundamental course and to develop and promulgate the advanced course.

President Wagner advised the committee that Mr. Wakeman had been invited to address the committee on the subject of America's Electrical Week. He outlined briefly the plans for this year's campaign. The association voted to indorse the movement.

Correspondence was submitted by the secretary with regard to the establishment of an employment bureau. It was generally felt by the members of the committee that it would not be a judicious thing for the association to engage in this class of work.

Messrs. Edkins and McClelland, as chairmen of the Commercial and Technical Sections, made a report on the study which they had made of Atlantic City as the place of the next convention in 1917. A general discussion ensued, led by Mr. Tripp, as to the desirability of continuing the large conventions, which had of late become so notable in association development. Mr. Lloyd thought that the ultimate perfect development of the Geographic Section system would take care of the case, and that the state bodies would relieve the national body of a great deal of pressure which now falls upon it. It was finally decided that the sub-committee on the subject of place for the next convention visit Pittsburgh at an early date.

Mr. Edkins brought up again the subject of a new Commercial section committee on compensation of salesmen, and nominated Mr. C. J. Russell of Philadelphia as its chairman.

The committee on the president's address at the Chicago convention had discussed the recommendation of Mr. Lloyd that serious thought might be given to the change of the name of the association. On recommendation of said committee, the matter had been referred to the incoming administration. On motion of Past-President Lloyd the matter was referred to the public policy committee.

Commercial Section Executive Committee

At the meeting of the executive committee at Atlantic City chairmen of the section committees and sub-com-

mittees reported the progress made at their meetings.

In addition to the Christmas booklet which is now being sent out, the committee on publication, which met jointly with the committee on co-ordinate advertising, will issue a booklet on the "Wiring of New Houses," to be sent to architects, builders and owners of houses to be constructed; also a booklet on the "Wiring of Old Houses," to be used in wiring campaigns.

There is also under consideration literature on show window lighting, store lighting, electric advertising (signs), electricity on the farm and educational literature for instructors in domestic science, which will be issued so soon as it is determined there will be a sufficient demand for it.

George H. Jones, chairman of the executive committee of the power sales bureau, reported that it had decided to ask for a half-day session at the coming convention, on a day which would not parallel with discussions of any other subjects which might be of interest to power salesmen. Also the committee decided to arrange for a get-together evening at the coming convention, similar to the power sales dinner so successfully given at Chicago.

T. F. Kelly, chairman of the lighting sales bureau, reported the appointment of the chairmen of seven subcommittees of the bureau as follows: Residence lighting, W. R. Moulton; electric advertising, G. S. Buller; store lighting, S. B. Burroughs; lighting public buildings, E. C. Kimball; commercial aspects on store and highway lighting, A. W. Young; industrial lighting, J. J. Kirk; outdoor lighting, C. L. Law.

Chairman Lobell of the industrial heating bureau reported that the bureau has decided to concentrate on heating appliances, and is planning to educate central stations to the great possibilities in the heating field.

Chairman Guilfoyle of the merchandising committee reported plans to give special attention to the merchandising situation in smaller central stations.

In the afternoon the executive committee of the Technical and Hydroelectric Section met with the commercial committee and discussed the membership of the two sections. It was decided to appoint cross-memberships on different committees. There will be appointed three technical members on the wiring committee, three on the power sales bureau, two on the lighting sales bureau and two on the industrial heating bureau.

The wiring committee reported that among other things it had been asked to consider the question of standardizing the appliance end of the portable cord, and is undertaking this matter in conjunction with the merchandising committee, and also has been asked to consider standardizing range connections.

EXECUTIVE COMMITTEE ELECTRIC VEHICLE SECTION

A meeting of the executive committee, Electric Vehicle Section, was held at association headquarters, New York, on Oct. 13, E. S. Mansfield, chairman, presiding.

Paul Fitzpatrick of the Guaranty Securities Corporation, addressed the meeting, explaining the scope of the association he represented, and the methods of his corporation in financing the purchases of motor vehicles (outlined in the ELECTRICAL WORLD for Oct. 14, page 785). It was decided to refer the matter to the manufacturers and central station co-operation committee.

Mr. Mansfield said that the manufacturers and central station co-operation committee was investigating the possibility of employing a high-grade man to visit the central stations throughout the country, selling the electric vehicle idea, in an endeavor to establish electric vehicle bureaus and to obtain the co-operation of central stations in the sale and exploitation of the electric vehicle.

Dr. Carl H. Reed, chairman of the motion-picture film committee, reported that the film illustrating electrically propelled fire apparatus was, as yet, in a somewhat incomplete state, and that he hoped to have it finished and ready for distribution within a few weeks.

The garage and rates committee has held one meeting, and the work is now under way.

Chairman Mansfield requested that all convention papers and reports be in his hands not later than March 1, 1917.

A meeting of the electric vehicle legislation committee was held Oct. 13 in the N. E. L. A. headquarters, Chairman Wagoner presiding.

It was agreed to appoint a sub-committee with A. Jackson Marshall as chairman, one of the functions of which will be to study the relationship of speeds and weights of electric vehicles and their effects on road surfaces, in order that definite recommendations may be made to the state commissions as to the proper sizes and weights of vehicles, and the speeds at which they might with safety be permitted to operate without injury to road surfaces.

CONFERENCE OF SECTION AND COMMITTEE CHAIRMEN

At a meeting of the conference of section and committee chairmen of the association held at Atlantic City, N. J., on Oct. 13, Mr. Wells, the chairman of the conference, brought up the subject of the expense which frequent committee meetings would impose on the larger Class A companies, who supply nearly all committee members. On a schedule of one meeting per month, which some committees have announced, this expense would run up to a very large sum. While there is no intention on the part of anyone of curtailing the committee work, it was agreed that this work should be carried out in as economical manner as possible under the exisiting conditions.

GEOGRAPHIC SECTION COMMITTEE MEETING

The first meeting of the Geographic Section for the season of 1916-1917 was held at headquarters, New York City, on Oct. 12, the chairman, L. D. Gibbs, presiding.

The meeting opened with a discussion of means tending to broaden the scope of the association's activities to include the consideration of all public utilities. The proposed affiliation of the Empire State Gas & Electric Association with the N. E. L. A. was placed in the hands of J. R. Werth.

It is proposed to form a section including New Jersey and Delaware. Other proposed sections where negotiations are now under way are Minnesota, the Mississippi Valley, Kentucky and the Southwest.

The Pacific Coast Section has been organized under the leadership of Vice-President R. H. Ballard of Los Angeles, to include the states of California, Nevada, Arizona, New Mexico and Utah, and negotiations are now pending looking toward the affiliation of the Indiana Electric Light Association with the national association.

Status of Los Angeles Service Situation

According to the latest reports received from Los Angeles considerable progress has been made by the conferences attended by representatives of the city and the local distributing companies. The Mayor's committee favors a maximum offer to the power companies for their systems of $10,000,000.

After some preliminaries the companies offered to deliver the desired portions of the distributing systems for about $12,000,000.

Proposed Dividend-Type Domestic Service Rate

One of Several Articles Outlining a Domestic Service Schedule Considering Cost of Service and Encouraging Use of Electricity for Electric Cooking and Water Heating

BY W. W. BRIGGS

General Agent, Great Western Power Company, San Francisco, Cal.

OWING to the fact that rate schedules must of necessity be predicated on the *value of service* as well as on the *cost of service*, as has been repeatedly demonstrated in many well-thought-out papers and discussions, it has been difficult so far to develop schedules that are reasonable, non-discriminatory and fair to consumer and company alike without making them complex. In fact, the closer schedules have been designed to serve all interests equally, the farther they are usually beyond the grasp of lay minds and the more difficult they are to apply. Furthermore, their complexity has often created suspicion and resentment, especially among domestic consumers. Since the amplification of domestic service by the introduction of electric cooking and water heating, present schedules have become still more inadequate in that they do not afford the necessary economy to stimulate such business, and usually require metering and load-policing devices which are too expensive to install.

Without disregarding the cost of furnishing service, however, the writer has developed a co-operative form of domestic service schedule which is simple to explain and apply, designed to encourage electric cooking and water heating, and should be attractive to consumers since it permits them to benefit according to the extent to which they use their connected load. In addition, the schedule has the advantage that it may be extended to all classes of electric service with only slight changes.

CHIEF OBJECTS OF SCHEDULE

In devising this proposed schedule of charges, it was the endeavor to attain certain results briefly as follows:

1. To present a rate that would apply to domestic service, furnish the different classes of load under one meter, and stimulate the utilization of electric energy for domestic purposes to a point comparable with other classes of service.

2. To design a schedule of energy charges which will enable each domestic consumer to use electric energy for lighting, cooking, heating, water heating and general domestic purposes at a monthly cost comparable with that of any form of fuel.

3. The preparation of a schedule in the simple block form which is readily comprehended by the layman.

4. To make possible the ultimate standardization of all rates for domestic electric service.

5. The development of a rate so designed as to be adaptable to billing from charts or standard tables, which feature will greatly reduce the clerical work incident to the complex billing of the present conventional-form schedules, and which, together with the elimination of inaccuracy, will enable electric service companies to render bills promptly and in a form which the consumer will readily understand.

6. To have a schedule which will be uniformly equitable to small and large consumers.

7. The providing of a schedule whose unit charges are based, as in power schedules, on the consumer's maximum demand or his connected load, yet which will not require the expense of costly demand meters or involve inspecting and policing the consumer's load.

8. The provision of requirements which will make it possible for a consumer to operate economically only with apparatus which does not impose an unusual hardship on the company's service.

9. Last, the provision of an annual dividend to stimulate the proper use of a particular part of the company's system dedicated to each consumer.

While the figures quoted in the accompanying schedule may apply only to Pacific Coast hydroelectric power companies, the form of schedule is readily susceptible of modification to suit the service rate requirements and operating conditions of any station or district. From a brief consideration of the rate table it is at once apparent that irrespective of the consumers' connected load, the actual monthly billing for energy consumption is primarily predicated upon the range within which the total monthly consumption happens to fall. For example, a 5000-watt consumer taking between 450 and 600 kw.-hr. per month will be billed under the 600-kw.-hr. and 10,000-watt basis. If the same 5000-watt consumer takes between 300 and 450 kw.-hr. per month, he will be billed under the 450-kw.-hr. basis which happens to correspond to the 7500-watt class. It should be noted, however, that the reversal of this condition does not apply, that is, a 10,000-watt consumer taking between 300 and 450 kw.-hr. is not billed under the

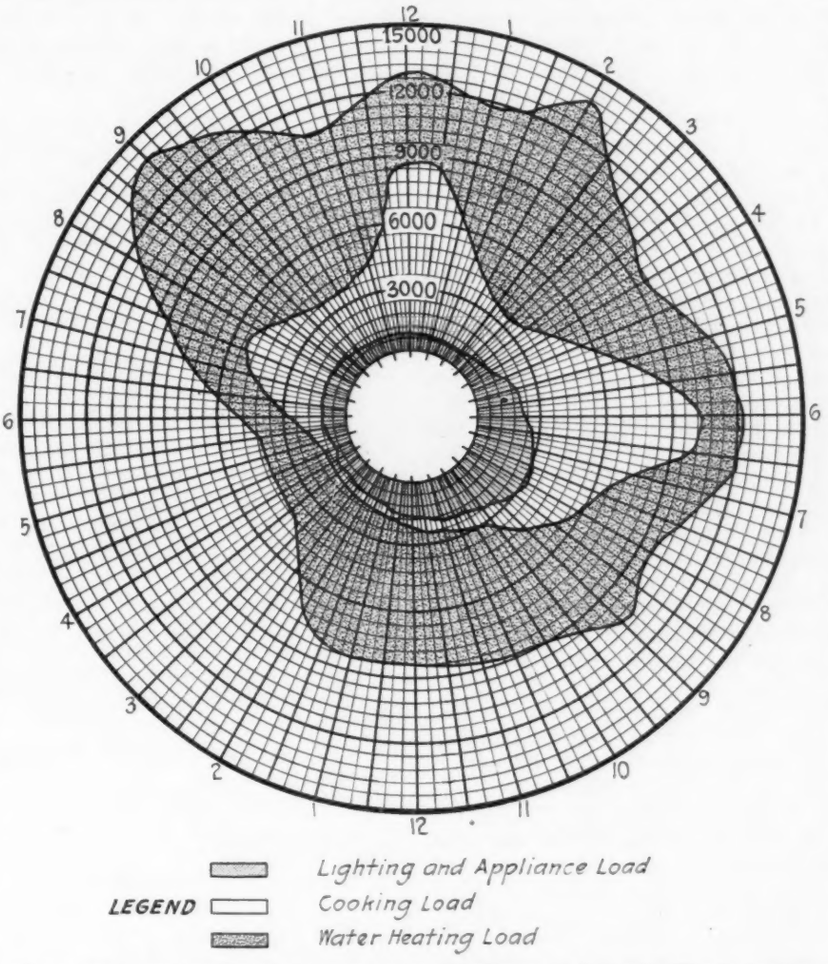
TABLE I—BILLING CHART (See Rule 4 on page 853)

Watts	5,000		7,500		10,000		12,500		15,000	
Kw.-hr.	300		450		600		750		900	
7c	**10–**	**0.70**	**15–**	**1.05**	**20–**	**1.40**	**25–**	**1.75**	**30–**	**2.10**
	10–	0.70	15–	1.05	20–	1.40	25–	1.75	30–	2.10
3c	**40–**	**1.20**	**60–**	**1.80**	**80–**	**2.40**	**100–**	**3.00**	**120–**	**3.60**
	50–	1.90	75–	2.85	100–	3.80	125–	4.75	150–	5.70
1½c	**100–**	**1.50**	**150–**	**2.25**	**200–**	**3.00**	**250–**	**3.75**	**300–**	**4.50**
	150–	3.40	225–	5.10	300–	6.80	375–	8.50	450–	10.20
1c	**150–**	**1.50**	**225–**	**2.25**	**300–**	**3.00**	**375–**	**3.75**	**450–**	**4.50**
	300–	4.90	450–	7.35	600–	9.80	750–	12.25	900–	14.70
Watts	17,500		20,000		22,500		25,000		27,500	
Kw.-hr.	1,050		1,200		1,350		1,500		1,650	
7c	**35–**	**2.45**	**40–**	**2.80**	**45–**	**3.15**	**50–**	**3.50**	**55–**	**3.85**
	35–	2.45	40–	2.80	45–	3.15	50–	3.50	55–	3.85
3c	**140–**	**4.20**	**160–**	**4.80**	**180–**	**5.40**	**200–**	**6.00**	**220–**	**6.60**
	175–	6.65	200–	7.60	225–	8.55	250–	9.50	275–	10.45
1½c	**350–**	**5.25**	**400–**	**6.00**	**450–**	**6.75**	**500–**	**7.50**	**550–**	**8.25**
	525	11.90	600–	13.60	675–	15.30	750–	17.00	825–	18.70
1c	**525–**	**5.25**	**600–**	**6.00**	**675–**	**6.75**	**750–**	**7.50**	**825–**	**8.25**
	1050–	17.15	1200–	19.60	1350–	22.05	1500–	24.50	1650–	26.95
Watts	30,000		32,500		35,000		37,500		40,000	
Kw.-hr.	1,800		1,950		2,100		2,250		2,400	
7c	**60–**	**4.20**	**65–**	**4.55**	**70–**	**4.90**	**75–**	**5.25**	**80–**	**5.60**
	60–	4.20	65–	4.55	70–	4.90	75–	5.25	80–	5.60
3c	**240–**	**7.20**	**260–**	**7.80**	**280–**	**8.40**	**300–**	**9.00**	**320–**	**9.60**
	300	11.40	325–	12.35	350–	13.30	375–	14.25	400–	15.20
1½c	**600–**	**9.00**	**650–**	**9.75**	**700–**	**10.50**	**750–**	**11.25**	**800–**	**12.00**
	900–	20.40	975–	22.10	1050–	23.80	1125–	25.50	1200–	27.20
1c	**900–**	**9.00**	**975–**	**9.75**	**1050–**	**10.50**	**1125–**	**11.25**	**1200–**	**12.00**
	1800–	29.40	1950–	31.85	2100–	34.30	2250–	36.75	2400–	39.20

7500-watt basis, because the values in that column are for loads not exceeding 7500 watts.

JUSTIFICATION OF PROPOSED DOMESTIC SERVICE RATES

The justice of exacting from the consumers a revenue proportionate to the utility's cost to serve is unquestioned, but in the minds of some it may at first appear unfair to bill the smaller consumers upon the same basis as a larger one when the small consumer has increased his consumption to a value numerically equal to kilowatt-hour consumption ordinarily expected from a consumer of larger capacity. The latter may be justified, however, by considering the factors affecting the cost of furnishing service. For instance, a central station's total cost to serve is dependent upon two or more variable charges, the principal ones *readiness-to-serve* cost and *energy* cost. The first factor will vary directly with the consumer's connected load and the maximum demand, these values being measures of the amount of utility property which the individual consumer commands for his exclusive use. For large loads, the readiness-to-serve cost is approximately proportional to the size of the load, but as the size of the installation decreases, the motor transformer and line investment rapidly approaches a fixed minimum, beyond which further reduction in the size of the load does not reduce the cost to serve. In Western practice, this point is found to be between 7 kw. and 15 kw. Since most domestic consumers and many small industrial plants fall in this class, the readiness-to-serve cost must be taken as a fixed quantity for such services. The second factor, the energy charge, is based upon the company's cost to generate electrical energy, and is therefore directly dependent upon the amount of energy which the consumer uses. For these reasons, the energy consumption is the only factor upon which a domestic service schedule should be based, provided there is quoted in the rate a dividend characteristic which will prevent undue hardship upon the small consumer when he has increased the earning capacity of his small load beyond that amount which the central station normally anticipates.



RESULTANT AND COMPONENT LOAD CHARACTERISTICS OF AMPLIFIED DOMESTIC SERVICE—LOAD FACTOR 75 PER CENT—ANNUAL REVENUE PER CUSTOMER $94—ANNUAL REVENUE PER KILOWATT OF DEMAND $125

Another feature of this schedule is that the consumer is not only induced to increase his consumption, but having bettered his operating conditions from the standpoint of the company, he is credited in terms of cash dividends at the end of the service year. These dividends are in direct proportion to the amount that the consumer increases his consumption per watt of demand. The dividends proposed are based on the earning capacity which the individual consumer produces for the company from the use of his particular part of the company's system, and is therefore proportional to the annual consumption per unit of the consumer's total rated capacity. It may be pointed out that the dividends, which range from 10 per cent to 25 per cent of the annual bills, apply only to domestic service. The reasons for not extending them to industrial and commercial heating consumers are as follows:

1. Stimulation of domestic service revenue is specially desired to make it comparable with the investment necessary to serve domestic consumers.

2. Development of electric service, using electric ranges and water-heating appliances, is specially desirable since it offers a diversity factor far in excess of that received from industrial and commercial heating projects, due to the fact that commercial heating requirements are more or less limited to daylight hours, so the load produced by them coincides with the industrial power load, whereas with amplified domestic service the load is well distributed over twenty-four hours.

SERVICE REQUIREMENTS THAT PREVENT INVALIDATION OF STANDARD POWER SCHEDULES

To prevent invalidation of power rates, quoted for application to individual loads having connected loads and monthly consumption far in excess of the individual domestic service, without limiting the application of the domestic service schedule or working undue hardship upon domestic consumers, it is necessary to provide the following service requirements.

To receive service under this schedule, the consumer must so wire his premises that all energy consumed may be measured at one point through one meter, and to participate in the dividends he must receive service from

the company for at least twelve consecutive months at the same address, and must promptly pay bills on or before the fifteenth day following the date upon which each monthly bill is rendered. Furthermore, all apparatus installed should be subject to the approval of the company; it being advisable to post a list of such devices in a conspicuous place in the company's various offices, or if possible made a part of contracts or bill forms used in the application of this schedule. As examples of what might constitute approved apparatus, the following are suggested:

Electric cooking apparatus shall not constitute an approved electric range unless it has 2500 watts or more of connected load. Electric water-heating apparatus, in order to meet the service requirements, should be non-inductive and should be controlled by a thermostat and electrically-wound time switch for connecting it during the off-peak period. Small domestic installations of water and air-heating apparatus not in excess of 3 kw. may be controlled by the thermostat alone. Instantaneous water heaters and clapper-switch controlled apparatus should be permitted on consumer's premises only when installed on a separate power circuit running back to the meter. The consumer should always be granted, however, the alternative of placing such apparatus on a separate power meter and paying for the operation of same in accordance with the minimum charges and unit charges effected for power service. In dealing with electric vehicle or battery charging apparatus, which has from 3 to 5 kw. of instantaneous demand, the consumer will naturally be required to connect same by an individual service line. When this schedule is extended to cover electric incubation and brooding, which it may be advisable to do to develop this service, the incubating apparatus should be thermostatically controlled to produce maximum economy and give the greatest possible diversity. To protect lighting service receiving energy supply from the same bank of transformers, it should be required that the thermostatic control be of such a nature as to prevent an instantaneous increase in demand in excess of 1000 watts; in other words, the thermostat should allow the current to increase in steps.

Since this schedule is based on the connected load of each consumer this value may be computed for monthly billing by totaling the rated capacity of each energy-consuming device with the following exceptions:

1. For application to this schedule, no installation shall be considered as having less than 5000 watts of rated capacity and therefore no bill will be rendered for less than 10 kw.-hr. at 7 cents, 40 kw.-hr. at 3 cents, etc., as indicated in the accompanying direct-reading bill table.

2. Thermally-controlled air and water-heating apparatus together with all devices limited to off-peak operation by means of time-switch control, shall be rated at 50 per cent of the total capacity. Air-heating apparatus not thermally controlled shall be rated at 100 per cent of the first 5 kw. installed, plus 50 per cent of such capacity as may be connected in excess of that amount. Air-heating apparatus, being purely seasonal, in use, might be rated at one-half full load for capacities in excess of 5 kw., where the central station happens to have a large irrigation load in the summer time, thus giving practically 100 per cent seasonal diversity, since air heating is naturally limited to winter and early spring.

3. Each lamp socket on the consumer's premises would be considered equivalent to 25 watts of connected load.

4. Motor loads, rectifying apparatus, instantaneous water heaters and all on-peak devices having an instantaneous maximum demand in excess of 1000 watts, should be isolated from the lighting and cooking service by means of a separate circuit, and for application to this schedule should be rated at twice their normal capacity. Such devices may be operated on separately metered circuits if desired by the consumer. While it might appear on first thought that the above requirement would be an imposition on consumers equipped with electric vehicle apparatus, instantaneous water heaters, small motors, etc., the amount paid for such service under the domestic service schedule, does not exceed what would be charged under separate meter systems. Without this requirement, it is apparent that a consumer equipped with an electric range and water heater would have a greater advantage in securing a lower rate for his electric vehicle or small motor than would a consumer producing perhaps a larger revenue from similar power apparatus limited to power rates merely because he did not have installed on his premises the required 2500 watts of range and approved water heater.

CONSUMER'S ANNUAL DIVIDEND SCHEDULE APPLYING TO GENERAL DOMESTIC SERVICE

This schedule applies to the electric service for all domestic combined lighting, heating, cooking and small power purposes, where the installation includes:

1. Approved electric cooking and water-heating equipment.
2. An approved electric range and 5000 watts or more of approved air-heating apparatus.
3. Four thousand watts or more of approved incubating and brooding apparatus.

The above listed devices are to be maintained in operative condition throughout the entire term of service under this schedule.

Note:

For application to this schedule, no installation will be considered as having less than 5000 watts rated capacity, and therefore irrespective of the connected load, no monthly bill shall be rendered for less than 10 kw.-hr. at 7 cents; 40 kw.-hr. at 3 cents, etc., as indicated in column 1 of the direct-reading rate table given below.

Base Rate

The following rate is quoted for application to a minimum of 5000 watts rated capacity with additional load computed to the next nearest 2500-watt unit:

7 cents per kilowatt-hour for the first 5 kw.-hr. consumed per month per 2500-watt unit of connected load (lighting).
3 cents per kilowatt-hour for the next 20 kw.-hr. consumed per month per 2500-watt unit of connected load (cooking).
1.5 cents per kilowatt-hour for the next 50 kw.-hr. consumed per month per 2500-watt unit of connected load (household heating).
1 cent per kilowatt-hour for the next 75 kw.-hr. consumed per month per 2500-watt unit of connected load (water heating).

Where the monthly consumption exceeds 150 kw.-hr. per month per 2500-watt unit of connected load, the billing under each of the above blocks is increased in direct proportion to the excess consumption, as indicated in the rate table below.

Rate Table

	Kw.-hr.						
Monthly consumption is less than..	300	450	600	750	900	1,000	1,200
and	Watts						
The total connected load does not exceed	5,000	7,500	10,000	12,500	15,000	17,500	20,000
Then	Kw.-Hr.						
The monthly rate is:							
7 cents per kilowatt-hour for the first	10	15	20	25	30	35	40
3 cents per kilowatt-hour for the next	40	60	80	100	120	140	160
1.5 cents per kilowatt-hour for the next	100	150	200	250	300	350	400
1 cent per kilowatt-hour for the next	150	225	300	375	450	525	600

Minimum Charge:

The minimum charge for electric energy supplied under this schedule shall be $2 per meter per month.

Connected Load:

The connected load in kilowatts to be used as the basis of the monthly billing shall be computed by totaling the rated capacity of all energy-consuming devices installed or maintained in operative condition on the consumer's premises, with the following exceptions:

1. Thermally-controlled air and water-heating apparatus, together with all devices limited to off-peak operation by means of time-switch control, shall be rated at 50 per cent of their total capacity. Air-heating apparatus not thermally controlled shall be rated at 100 per cent of the first 5.0 kw. installed, plus 50 per cent of such capacity as may be connected in excess of 5.0 kw.

2. Motor-load, rectifying apparatus, instantaneous water heaters, and all on-peak devices having an instantaneous maximum demand in excess of 1000 watts, must be isolated from the lighting and cooking service by means of a separate circuit, and for application to this schedule shall be rated at twice their normal capacity. At the consumer's option, all such devices having power characteristics of operation may be separately metered and the energy consumption billed for in accordance with the company's standard power rates effective in the district.

3. Each lamp socket on the consumer's premises shall be considered equivalent to 25 watts of connected load.

Domestic Consumer's Annual Dividend:

Any domestic consumer using more than 1 kw.-hr. per service year per watt of his total rated capacity shall earn the following percentage dividends, which, when applied to the gross of his twelve months' receipted bills, will be paid in cash at the company's nearest office:

Kilowatt-hours Per Year Per Watt of Load	Annual Dividends on 12 Months' Bills
In excess of 1.0 kw.-hr. per year per watt	10 per cent
In excess of 1.2 kw.-hr. per year per watt	14 per cent
In excess of 1.4 kw.-hr. per year per watt	17 per cent
In excess of 1.6 kw.-hr. per year per watt	19 per cent
In excess of 1.8 kw.-hr. per year per watt	21 per cent
In excess of 2.0 kw.-hr. per year per watt	23 per cent
In excess of 2.25 kw.-hr. per year per watt	24 per cent
In excess of 2.50 kw.-hr. per year per watt	25 per cent

Note:

The consumer relinquishes all claim to the above quoted dividends if:

1. The consumer fails to receive the company's service for the full twelve-month period constituting the "service-year."
2. If the consumer fails to pay his service charges before the fifteenth consecutive day following the last day of each full month's service.

How Checking Consumer's Load Is Simplified and Bills Are Rendered

With the monthly charges based upon the connected load, it appears that there will be some difficulty in checking consumers' connected loads from season to season, as they naturally increase, due to the introduction of new electrical devices and to the greater popularity of present household appliances. The method by which this schedule may be most successfully exploited, however, affords by its very nature an inducement to the consumer to exercise the utmost frankness in dealing with the company, and at the same time obviates the necessity of any systematic and periodic inspection of the consumer's premises to discover appliances which may not be disclosed. To encourage this condition, it is suggested that the application agreement be drawn up in as dignified and impressive a form as possible. One sheet of the form should be reserved for pasting in receipts for monthly bills, these being held by the consumer as a basis for claiming the dividend at the end of the year. When the consumer applies for the dividend, he may be requested to sign a new agreement, the salient features of which transaction will be the reiteration of the consumer's connected load and the tabulation of each and every energy consuming device which he may have purchased during the preceding year. It should be understood, however, that the rate if properly designed will produce the desired revenue when based only upon the consumers' lighting, range and water-heater loads. These alone are the devices which materially effect the resultant characteristics of the amplified domestic loads and cannot be misrepresented nor concealed by the consumer. Small cooking and power applications, even including small portable air heaters, have such a high diversity that their use will never impose undue hardship upon the company, even if totally neglected in computing the connected load.

Aside from the automatic adaptability of this schedule to any and all sizes of consumers, one of the most distinctive features of the schedule is the readiness and ease with which bills may be rendered. In the application of this rate each consumer being served would have appended to his respective billhead stencil retained in the district office an index number such as "W-5000-K-300." This would indicate that the consumer in signing his application for electric service under this schedule had declared that his connected load was in excess of 5000 watts and the K-300 then represents that corresponding maximum monthly kilowatt-hour consumption which will be billed on the 5000 watt basis.

As nearly as can be expressed in rules, the operation is approximately as follows:

1. Note whether the monthly consumption is in excess of the code number on the consumer's bill-head.

2. If not in excess, bill in accordance with readings given in the column corresponding to the code number.

3. If monthly consumption exceeds code number, bill in accordance with readings given in column where the monthly consumption falls within the range of kilowatt-hours expressed at the top of the column.

4. Having determined the column under which the consumer should properly be billed, subtract from the monthly consumption the kilowatt-hour value in dark or bold-face type nearest to but less than the consumption. (Table I.) Multiply remainder by the unit charge of the next block (this unit charge usually being 1 cent and therefore multiplication is eliminated) and add this product to the dark dollars and cents figure corresponding to the first dark kilowatt-hour figure. The resulting amount is the monthly billing.

To obtain an idea of the revenue which may reasonably be expected from 10,000 domestic consumers to which this schedule has been granted, let us assume that the average domestic consumer will require energy in the following proportions:

Lighting	15 kw.-hr. per month
Cooking	100 kw.-hr. per month
Appliances	10 kw.-hr. per month
Water heating	250 kw.-hr. per month
Small power (average of all consumers)	25 kw.-hr. per month
Total	400 kw.-hr. per month

Taking 7500 to 10,000 watts as the average connected load the billing for 400-kw.-hr. per month would be:

300 kw.-hr	$6.80
100 kw.-hr., at 1 cent	1.00
Total average	$7.80

Average revenue per kilowatt-hour:

$$\frac{7.80}{400} = 1.95 \text{ cents per kilowatt-hour}$$

Annual revenue per consumer, $12 \times \$7.80 = \$93.60$.
Gross annual consumption per consumer, $12 \times 400 = 4800$ kw.-hr.
Gross annual consumption for 10,000 consumers = 48,000,000 kw.-hr.
Annual revenue, 10,000 consumers at \$93.60 = \$936,000.

As nearly as can be computed the annual load factor from this amplified domestic service would be about 75 per cent. Hence the maximum demand imposed upon the system would be 48,000,000 kw.-hr. divided by 8760 hours $\times$ 75 per cent load factor equals 7300 kw., or to be conservative, say, 7500 kw. This in turn develops that from amplified service there is an available revenue of \$936,000 divided by 7500 kw., or \$125 per annum per kilowatt of demand. Superimposing a load curve resulting from the operation of 10,000 domestic heating consumers upon the industrial load curve of a typical Western hydroelectric station, it will be observed that the peaks of the loads are so diversified that the combined or resultant peak is not 7500 kw. greater than the peak of the industrial load, but only 3750 kw. higher. Dividing 3750 kw. into the gross annual revenue of \$936,000, we develop the conclusion that the central station derives an annual revenue of \$250 for each kilowatt of additional station capacity which this amplified service of lighting, cooking and thermally controlled water-heating apparatus demands.

Every central station has different operating conditions, which in turn have seasonal and daily variations, different annual operating ratios and different net energy costs per kilowatt-hour, so the figures used in the schedule reproduced herewith should not be looked upon as applying to all conditions but merely as a means of illustrating a principle. In short, a hastily designed schedule of this type would bring loss to the utility, whether it were too high or too low. It is believed, however, that the general scheme as developed in this schedule may be amplified and schedules ultimately developed which will enable it to be applied to other classes of central station electric service.

Representation in Foreign Electrical Markets

Developing New Ways and Means of Establishing Lasting Export Relations with Overseas Buyers

JAMES A. FARRELL, president of the United States Steel Corporation and chairman of the National Foreign Trade Council, states to the ELECTRICAL WORLD:

"Few industries in the United States are now unrelated to foreign trade. Even those which do not directly export or import are affected at some point by the productive, merchandising, transportation or financial elements in oversea commerce. The development of sound foreign trade policy, therefore, is necessary to the complete and well balanced prosperity of American business. Such a policy is now in course of formulation and its effectiveness largely depends upon the willingness of business men to study questions of foreign trade and co-operation with government in the formulation of policy."

IN working to promote interest in export trade the ELECTRICAL WORLD realizes that the electrical manufacturers of the country are divisible into three classes: First, those that have developed a foreign business of substantial size and have highly organized departments giving exclusive attention to it; second, companies which do a little export trade, mainly through commission merchants; and third, manufacturers that have never embarked on this business or considered its possibilities.

With the first class of companies, comprising the largest corporations and some of the others, the question of representation in foreign countries, to which this article of the series is mainly devoted, has received thorough analysis. These properties are represented abroad by all of the different methods of representation known. They have companies in which they own substantially all of the stock, companies in which they have a stock interest, branch houses, local native representation, agencies held by New York commission merchants and individual traveling salesmen. The method of representation which they have adopted is that which they believed would give the most efficient results in each particular territory; in other words, they have not sought to follow a standard method of securing representation, but have judged each country or section of the world in view of the particular conditions obtaining there and have reached individual decisions in each case.

64TH CONGRESS, 1ST SESSION. **H. R. 17350.**

IN THE SENATE OF THE UNITED STATES.

SEPTEMBER 1 (calendar day, SEPTEMBER 4), 1916.

Read twice and referred to the Committee on Interstate Commerce.

AN ACT

To promote export trade, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That the words "export trade" wherever used in this Act

THE WEBB BILL WILL PROMOTE EXPORT TRADE BY SMALL ELECTRICAL MANUFACTURERS

SHANGHAI OFFICE OF GASTON, WILLIAMS & WIGMORE ELECTRICAL ENGINEERING CORPORATION, AGENT IN CHINA FOR THE WESTINGHOUSE ELECTRIC EXPORT COMPANY

Of course, so large a range of methods of securing representation in foreign countries is not open to the manufacturer of limited capital, whose trade in overseas markets does not reach sufficiently large proportions to justify great expenditure. Such a producer must rely to a material extent upon existing sales agencies or those which will be available if Congress enacts new legislation upon the subject.

It is of much interest to record the opinion of Maurice Coster, managing director of the Westinghouse Electric Export Company, as to the virtual dependence of the average small electrical manufacturer in this country upon export associations if he is to develop foreign trade. Mr. Coster feels that it will be exceedingly difficult, if not impossible, for the average small manufacturer to reach foreign markets without the assistance of export associations in which he may legally combine with other manufacturers on all questions affecting overseas customers—prices, credit, delivery, etc. The large manufacturers do not need to combine, because the volume of their business is so great that they can go ahead independently as they have done in the past. The argument which Mr. Coster makes is that the average small manufacturer confronts a market with which he is unfamiliar and in which his unknown or little known name and products are set in competition against powerful European export associations skilled in the knowledge of foreign markets and having the advan-

tage of a reputation with buyers which has been built up during past years when industrial America neglected remote trade.

Mr. Coster expresses full confidence that the Webb bill, which has already been passed by the House of Representatives, will also be approved by the Senate, and that thus the law will be so clarified as to make it possible for manufacturers to combine interests on foreign trade. This will help small companies.

M. A. Oudin, manager of the foreign department of the General Electric Company, was interviewed by the representative of the ELECTRICAL WORLD upon the subject of foreign representation. Mr. Oudin, as a member of the National Foreign Trade Council and as chairman of the export committee of the Electrical Manufacturers' Club, has been especially interested in the possibilities of the exploitation abroad of the electrical products of American manufacturers.

Mr. Oudin stated that he believed that manufacturers who contemplated embarking upon the export business would do well to carefully investigate all methods of representation. Mr. Oudin regards, at the present time and under the present circumstances of our export trade, the commission merchant as one of the most important means of developing foreign markets, especially for the small manufacturer. As the first step for a manufacturer engaging in the export business, Mr. Oudin suggests a campaign of advertising in papers published in this country having a circulation in foreign countries. If such advertising leads to inquiries and subsequent sales, the commission house will find itself forced into the position of handling the goods in question. If the sales are sufficiently large, the next step in the campaign would be to advertise in papers published in the countries whose markets have been reached.

For manufacturers who are without fundamental knowledge of matters affecting export trade, Mr. Oudin recommends membership in export trade associations of the character that exist at the present time. These furnish general information not accessible or readily available to the manufacturer, but do not act directly in effecting sales, as do the export associations or foreign combinations of manufacturers in Germany and in England. Export associations of this character will be permitted should the Webb bill be enacted into law. Mr. Oudin regards these associations as of the very highest importance in the development of our foreign trade. This instrumentality for acquiring foreign trade is more or less experimental, as it has been tried only to a limited extent in this country and then mainly between manufacturers of non-competing lines.

Owing to the difficulties of the languages and customs in some foreign countries, especially in the Orient, Mr. Oudin states that even for large manufacturers it is probable that more desirable results may be secured by the appointment of agents than by direct representation. Mr. Oudin expresses the opinion that the average manufacturer who is thinking of entering the export business would be wise to investigate the advantages of jobbers, associations, personal traveling representatives, branch offices, etc., in the various countries which he feels would offer a market for his goods.

One commission merchant stated frankly that in his opinion American electrical manufacturers would never develop foreign markets successfully until they came to feel, like continental European manufacturers, that their bread and butter depended on it.

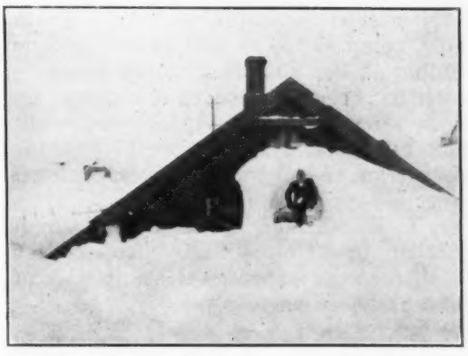
The view of this merchant is that it would not be profitable for him to develop a market for American electrical products unless he were positively assured as to the financial responsibility and power of the manufacturer to produce goods of high quality and to rectify any mistake. He favored a large company with great financial resources, partly because of the extended and varied line of products which such a company carries. An electrical company, he felt, was more difficult to represent successfully in foreign countries than concerns in other forms of industry because of the large element of engineering in its products, requiring engineering training and skill in salesmanship and installation, and perhaps after operation if any unexpected problems developed. He believes that he could not afford to make exclusive contracts which might debar him from connections with other manufacturers.

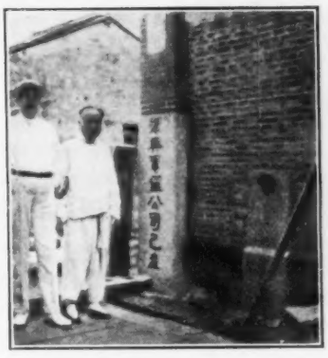
The representative of another large New York commission house who was interviewed by the ELECTRICAL WORLD stated that the amount of electrical manufacturers shipped abroad by others than the largest manufacturers is larger than is generally realized.

The criticism was made by this merchant that the average manufacturer expects to obtain results in a month. He cited one manufacturer whom he represented for three years before he obtained a single order. Last year a large business was done for this manufacturer, and now it is felt certain that a permanent export trade has been built up.

The commission merchant cited an illustration of an order received by him for a small type of electrical apparatus. He said that it would have involved an expenditure of several hundred dollars for dies. It was a type which was standard in the country from which the order came. The manufacturer was approached with the proposition that he charge part of the cost of the dies to this job and take a chance that he would get later orders to absorb the balance. He declined.

"If you will get your people to adopt the metric system you will do more than can be done in any other way to promote the export trade of the electrical manufacturers," said the representative of a New York commission house. "That should be supplemented by a willingness to give us firm prices which we can quote freely on products as good for say thirty days.





Foreign Representatives Have Many Experiences—Messrs. Brofos, I. Sternefeld, General Manager in China for the Gaston, Williams & Wigmore Electrical Engineering Corporation, Agent in that Territory for the Westinghouse Electric Export Company, with a Chinese Customer

culties with the Weather on a Trip in Norway. McBerty and Reinke of the Western Electric Company Had Diffi-

OPERATION OF ELECTRIC DRAGLINE EXCAVATORS

Methods for Supplying Energy to Excavators and Cost of Operation in Government Drainage Work at Boise, Idaho

The drainage work on the Boise Project of the United States Reclamation Service in the vicinity of Caldwell and Nampa, Idaho, is being successfully carried out by the use of electric dragline excavators. Energy for the work is secured from a power plant operated by the government reclamation service at the mouth of the Boise River Canyon about 8 miles above Boise. This plant also furnished energy for the construction of the Arrow Rock dam and was built primarily for that purpose. Energy is also taken from a 44,000-volt transmission line of the Idaho Power & Light Company in the region of the contemplated work. The government lines are tied in with this system above Boise.

FIG. 1—POLE SWITCH HOOKS FOR CONNECTING EXCAVATOR TRANSFORMER CABLES TO TRANSMISSION LINE

Four excavators of the same type and capacity, having caterpillar traction, 50-ft. booms, 9.5-ft. swing circles and 1.25 cu. yd. buckets are used. They are designed to operate on 440-volt, three-phase, 60-cycle, alternating-current supply. The caterpillar drive and the drag drums of the excavators are driven by direct geared 80-hp. motors controlled by a drum-type controller provided with resistance, switchboard and circuit breakers. The swing machinery is operated by a 40-hp. motor provided with a drum-type controller for quick acceleration, designed to make it possible to reverse at full speed. The operating crew consists of two men for each excavator—the operator and an oiler.

The total drainage results accomplished on the Boise Project with the electric excavators to June 1, 1916, consists of the removal of 3,762,350 yd. of material in approximately 93 miles of open ditches. The ditch sections vary from 10-ft. base 2 to 1 slopes, to a 5-ft. base 1.5 to 1 slopes, and the average cut approximates 10 ft.

At the field camp headquarters a substation is located which transforms the current to 4000 volts. The transmission lines erected for the drainage construction carry 4000 volts and are built and rebuilt as needed in the construction of the various drains. In the building of these lines, 30-ft. poles are generally used and No. 4 bare copper conductor. The connection from the transmission line to the other transformers which are carried on the dredges consists of No. 6 B & S gage triple conductor armored cable, and connection is made from the three wires of this cable to the transmission lines by hook switch terminals fastened on the ends of light 25-ft. poles. The connection is transferred from pole to pole as the construction proceeds, and the 300-ft. length of cable used allows the passing of obstructions.

The average energy used is approximately 0.88 kw.-hr. per cubic yard of material excavated, varying with the material excavated, being as low as 0.39 kw.-hr. in light sandy loam including all line and transformer losses.

The use of power has been very convenient around the headquarters camp, where a machine shop is electrically operated to handle repairs and also for use in pumping water in the construction of culverts. Each excavator is lighted by two inclosed-type flaming arc lamps.

According to J. L. Burkholder, drainage engineer of the Boise Project of the United States Reclamation Service, Nampa, Idaho, the approximate unit cost of excavation to date has been as follows:

Expense Item	Excavation Cost per Cu. Yd.
Labor cost	$0.0229
Electrical energy (at 1 cent per kilowatt-hour) and supplies	.0195
Installing transmission and telephone lines and substations, including cost of materials	.0125
Total	$0.0549

The above total is exclusive of depreciation and general expenses.

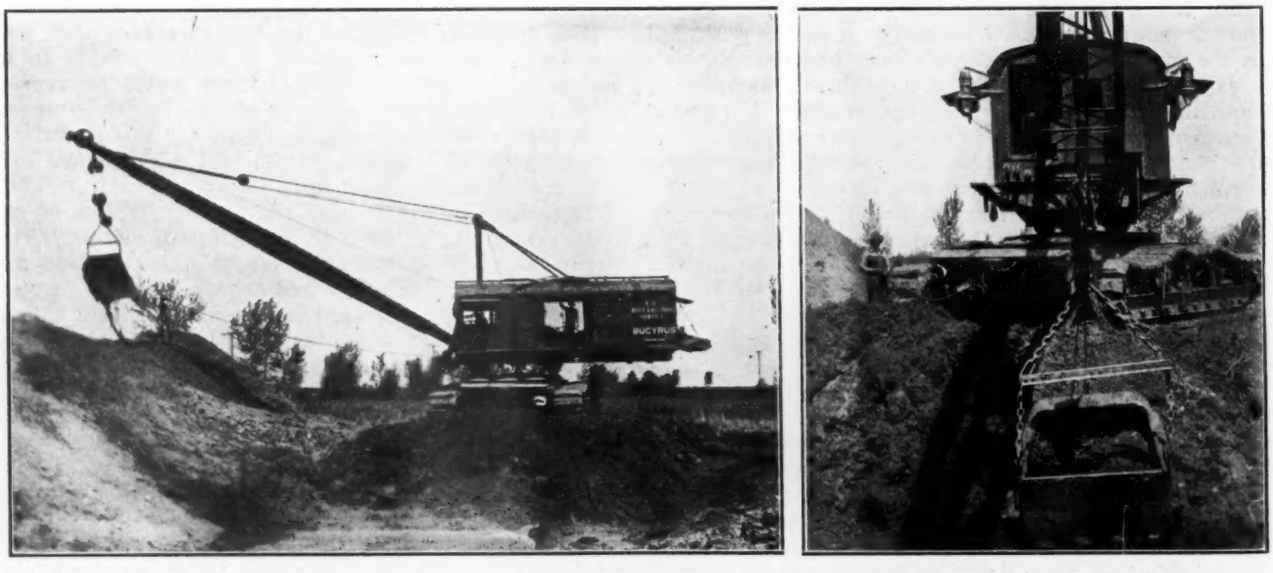


FIG. 2—ELECTRICALLY OPERATED EXCAVATOR USED ON BOISE PROJECT OF UNITED STATES RECLAMATION SERVICE

Operation of a Lamp-Service Department

The Plan by Which the United Electric Light and Power Company, New York City, Furnishes Lamps and Lamp Renewal Service to Its Customers—Lamp Service Supplied at 0.5-Cent per Kilowatt-hour Added to Bill for Energy

BY L. A. COLEMAN

THE recent change in the lamp policy of the United Electric Light & Power Company of New York City, by which customers are now furnished lamp-renewal service on payment of an extra ½ cent per kilowatt-hour for energy consumed by the lamp installation, and the desire of the officials of the company that this service be made popular and of a distinct benefit to its customers, rendered necessary the adoption of the comprehensive system for the operation of the lamp department which is now in use.

An active campaign to obtain the lamp business of the company's customers was begun immediately after the announcement of the change. To date approximately 31,000 customers have signed the lamp-service agreement. To all of these customers there are supplied Mazda lamps in sizes of 50 watts and larger without extra charge, and Mazda lamps of smaller sizes at an additional price to cover the cost of the lamp to the company.

Renewals are made upon request, and for this purpose each customer is furnished with postcards to be used when ordering lamps. The order form adopted is

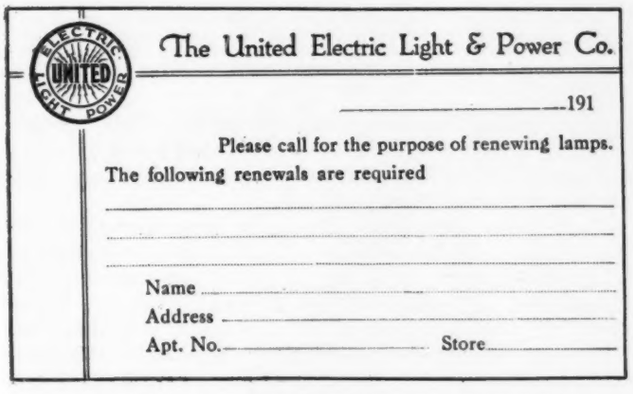


FIG. 1—FORM OF POST CARD FURNISHED CUSTOMERS FOR ORDERING LAMPS

reproduced in Fig. 1. In addition, a periodic service is maintained for all lamp-service customers, and a call is made every three months to make whatever changes are necessary in the lamp equipment.

CHECKING OVER THE ORDERS

With only a portion of the company's customers paying the lamp-service charges, and the consequent salable value of the lamps, the need for a special examination of all orders for lamps and a comparison of the lamp deliveries with the lamp-service charges is obvious. In the early days of the operation of the new schedule it was frequently found that a lamp-service customer would order lamps which it was intended to use on a neighboring installation where no lamp service agreement had been signed, or that a customer using service at more than one address would attempt to secure lamps for the various addresses through a lamp agreement covering but one of the premises.

It was also found, after the adoption of the new system, that the scope of the duties of the clerks of the lamp department were greatly enlarged, and it became necessary to divide the work into districts. The city is now laid out in eight districts, a clerk being in charge of each and attending to all lamp matters for the particular locality covered by that district. A receiving clerk, a record clerk, a special service clerk and a supervising clerk in charge, whose duty it is to see

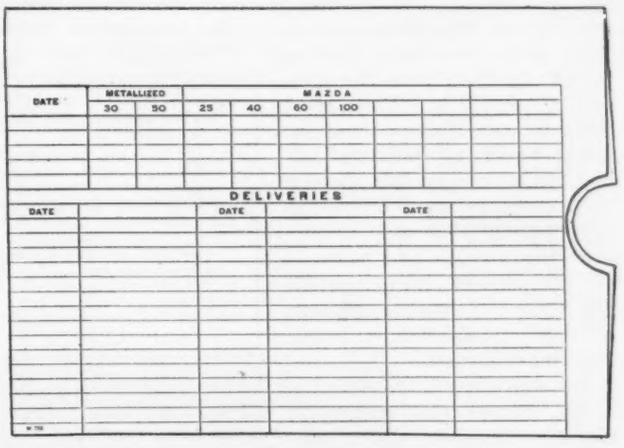


FIG. 2—LAMP-RECORD ENVELOPE

that the orders and other work of the department are properly distributed and attended to, make up the personnel of the company's lamp-service department.

OPERATION BY DISTRICTS

The district system was introduced for the purpose of aiding all customers, those classified both as "lamp service" and as "non-lamp service," to obtain prompt

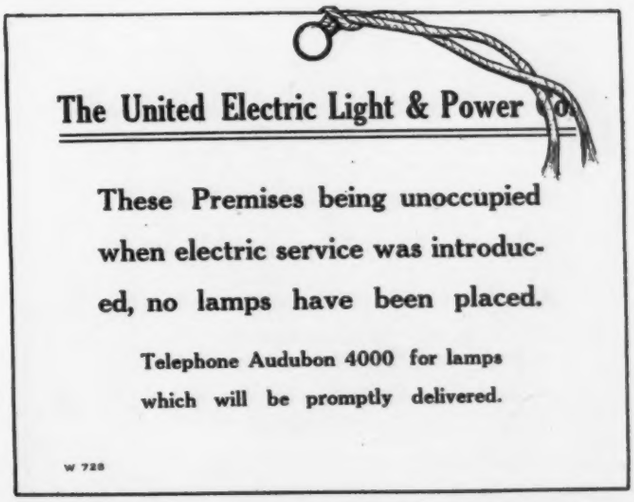

The United Electric Light & Power Co.
These Premises being unoccupied when electric service was introduced, no lamps have been placed.
Telephone Audubon 4000 for lamps which will be promptly delivered.
W 728

FIG. 3—TAG LEFT BY "CUT-IN" MAN WHEN NO RESPONSIBLE PERSON IS PRESENT TO RECEIPT FOR LAMPS

deliveries and so make the lamp service a source of real satisfaction to the customer. All deliveries to customers are carefully checked as to quantity, type, etc., so that any violations of the lamp service agreement can be discovered before the lamps are delivered. Fig. 2 shows the lamp-record envelope adopted.

In addition to the expansion of the lamp-record department it was necessary to form a new department known as the lamp-service bureau. To this bureau are sent all complaints concerning lamp charges, requests for cancellation, and all other matters pertaining to lamp service, other than the actual delivery of the lamps.

From time to time since the operation of this new schedule various problems have arisen which needed prompt solution, for example:

Shortly after the change of lamp-renewal policy it was found that lamps which were delivered to an installation before the current was turned on, and where the occupant had not as yet taken possession, were sometimes lost or stolen by the time the customer moved in. To correct this, it was decided that no lamps would be delivered unless some responsible person is present to sign for them. If a "cut-in" man calls to connect the service and there is no one present, he leaves the tag (Fig. 3), which explains to the customer how lamps may be obtained.

It was also found that many of the customers did not sign lamp-service agreements, as they did not thoroughly understand the plan of operation of the lamp service. To relieve this condition a card is hung on the premises, stating that no lamp-service contract "rider" has been signed by the customer in taking out service, and that

FIG. 6—ONE OF THE ELECTRIC LAMP-DELIVERY WAGONS OF THE UNITED ELECTRIC LIGHT & POWER COMPANY

therefore no lamps have been delivered. This double tag, Fig. 4, gives the necessary information explaining how lamps can be procured, and has a mailing card which can be torn off, stamped, and mailed in to secure the lamp service.

In addition to supplying its lamp-service customers, a general lamp business is done with those customers who have not signed the lamp-service agreement, the company's schedule price being lower than that maintained by the dealers. An attractive booklet has been issued and a copy of this is supplied to every customer when signing an application for light. This booklet, which has for its title "Lamps and Lamp Service," gives in concise form the details of how a customer may obtain lamps from the company.

One of the great problems of the new system was the question of prompt delivery. Prior to the introduction of the lamp-service plan any lamp ordered, and on which a charge was made, was treated exactly like an order for a motor, appliance or other piece of merchandise. The order passed through various channels of the sales and credit departments and deliveries took in some cases from three to four days.

In the effort to popularize the lamp business, the adoption of a new lamp-merchandising system, therefore, became necessary. Having in mind the simplicity of the method in use by the large department stores in New York City, a system was laid out along similar lines, and so far has met with complete success.

A Delivery-Sales Plan Borrowed from the Department Store

When an order is received for lamps, this goes to the lamp-service department and to the district clerk covering the territory from which the order comes. Here it is then stamped "Lamp Service" or "Non-Lamp Service," after which it goes to the credit department for approval, and is then returned to the lamp department to have the delivery tickets made out. These tickets are drawn in quadruplicate. They contain all the information, prices, etc., and are in every sense of the word an invoice for the lamps. One copy is sent to the bookkeeping department to be entered in the customer's account on the ledger; one copy is retained in the lamp-service department for their numerical record, and two copies are sent with the lamp-delivery man. One is signed by the customer and returned to the lamp

THE UNITED ELECTRIC LIGHT & POWER CO.
General Offices
130 East 15th Street

LAMP SERVICE

Your application covering the supply of electricity at these premises does not include the Lamp Service rendered by this company.

If you desire this service
Telephone Audubon 4000—Lamp Department.
and our man will call. Give him attached card, signed, **and he will install lamps.**

The United Electric Light & Power Co.
130 East 15th Street, New York.
Lamp Service:

You are hereby requested to furnish in connection with the supply of electricity to ... premises, the first installation of incandescent lamps and subsequent renewals thereof; also the supply, care and maintenance of arc lamps, for which service ... agree to pay at the rate of ½c. per kilowatt hour, based on the weekly or monthly lighting bill, to which this charge is to be added.

It is understood and agreed that lamps so furnished are to remain the property of, and may be removed from the premises by, the Company upon the termination of the supply

Date..... Name.....
Address.....

FIG. 4—REMINDER TAG

This tag, left on the premises in cases where the customer has failed to sign a contract for lamp-renewal service, explains the plan of renewals and provides a mailing card for ordering the additional lamp service if desired.

Date No. 5397
Ordered by Letter Personal Call Telephone
Name
Address
Part Lamp Service Non-Lamp Service
By The UNITED ELECTRIC LIGHT & POWER CO., Dr.

No. Lamps Delivered	Size and Wattage	Price	Amount	Returns No.	Returns Size
Maximum					

I hereby acknowledge receipt of above lamps, in good condition, and agree to pay for same in accordance with the terms of sale.

Signed.....
Per.....
Delivered by..... Date..... 19....

No other bill will be rendered for this delivery. If delivered C. O. D., see that deliverer receipts for amount paid. If charged please hold to check with amount added to your lighting bill.

FIG. 5—SALES TICKET

This ticket is made out in quadruplicate, two copies are sent out with the deliveryman, one being receipted by the customer and returned to the office while the other is given to the customer as his invoice.

department, and constitutes the receipt for the lamps, and the other is left with the customer as his invoice for the goods delivered. No other bill is rendered, but all items purchased during the month are added in total to the monthly lighting bill.

Since the introduction of this system on April 1, every order for lamps received by this company has been completed within twenty-four hours from its receipt, unless for some reason the lamps were not in stock or the department was unable to obtain admission to the premises where the lamps were to be delivered. In the latter case a card is left reading: "In response to your request for lamps a call was made to your apartment to-day. We were prevented from making a delivery as we could not obtain access to your premises. A call will be made again to-morrow."

Personnel of Lamp-Deliverymen

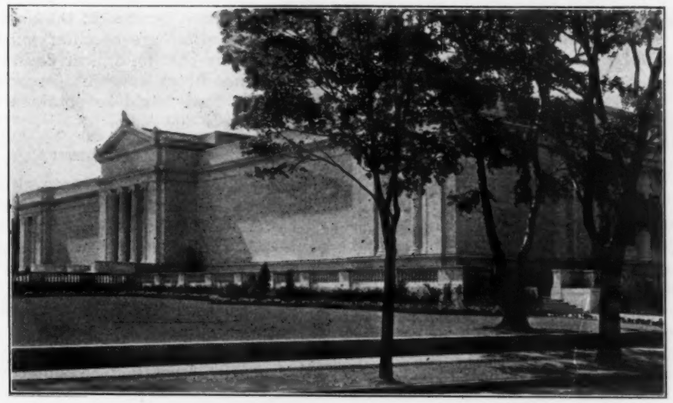
Another important feature is the change made in the personnel of the lamp-delivery department. Heretofore the deliveries had been made by boys ranging in age from fifteen to eighteen years. It was found, however, that many questions arose in connection with the change, and it was necessary to replace these boys with young men whose ages average from twenty to twenty-five years. This has been found to give better satisfaction in every way. In addition, all of the employees of this department have been furnished with neat uniforms by the company.

Monthly meetings are held by the employees of the department, experiences are exchanged for the benefit of all, and examinations are held at regular periods to ascertain their knowledge of the lamp policy of the company.

Many questions have, of course, arisen since the inauguration of this new system, but the public is gradually learning the details of the change, and the new lamp service on the lines of the United Electric Light & Power Company in New York City may now be called an established policy.

Lighting an Art Gallery with "Daylight" Lamps

The Notable Installation in the New Cleveland Museum of Art, Where the Artificial Illumination Closely Simulates Daylight in Color and Distribution



THE NEW MUSEUM OF ART, CLEVELAND

ASIDE from its distinction of being one of the largest installations of "daylight" incandescent lamps thus far put into service, the lighting of the new Museum of Art at Cleveland is notable for the degree of control which has been achieved in directing the distribution of light—both artificial and natural.

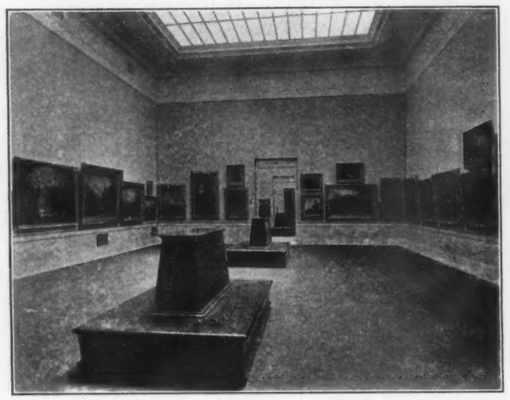
By means of motor-operated louvres which control the admission of sunshine and daylight to the skylights over the top-lighted painting galleries it has been found possible to deliver a more nearly constant intensity of daylight (which would otherwise vary greatly throughout the day and the year), and to preserve a balance of illumination on opposite walls of the galleries. The use of these louvres also decreases the excessive downward light and eliminates the "rake" of the sun.

In the artificial lighting of the museum the use of "daylight" lamps has proved of the greatest importance in bringing out the true color values of the paintings and art objects when the galleries are illuminated for inspection during after-dark hours.

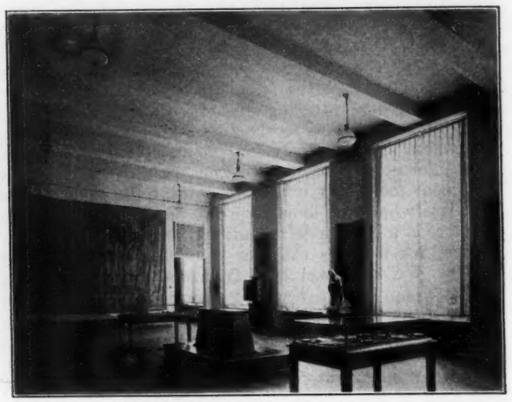
The design of the lighting of the museum structure was handled by a special committee whose chairman was Dr. E. P. Hyde and whose report to the building committee of the board of trustees forms the basis of this article. The burden of the work of proposing and supervising the various installations was carried on by a sub-committee consisting of E. J. Edwards, Ward Harrison and M. Luckiesh, to whom the general committee expressed its obligations in the report above mentioned.

Top-Lighted Paintings Galleries

The top-lighted paintings galleries, which have occasioned particular interest, measure 33 ft. in width and are of various lengths, aggregating 230 ft. They contain no windows, but natural daylight illumination is provided by a sub-skylight 24 ft. above the floor. The glass for the roof skylight had been chosen and already installed before the lighting committee was appointed. This was also true of various architectural features, such as the area of the sub-skylight opening and the character and position of the structural beams in the attic space.



ONE OF THE OVERHEAD-LIGHTED GALLERIES WHERE THE ARTIFICIAL ILLUMINATION CLOSELY SIMULATES DAYLIGHT IN DISTRIBUTION AS WELL AS COLOR



FIXTURE UNITS IN ONE OF THE SIDE-LIGHTED GALLERIES ON THE NORTH SIDE OF THE MUSEUM. "DAYLIGHT" LAMPS ARE USED IN THE CEILING FIXTURES

With respect to the control of natural daylight illumination as well as artificial lighting, it was the aim of the committee:

1. That the brightness of the floor and ceiling should not be disproportionately large in comparison with the brightness of the walls.

2. That the amount of downward light should not be disproportionately large in comparison with that directed toward the important wall space.

3. That there should be no opportunity for the reflection of bright portions of the skylight from the glazed pictures into the eye of an observer standing at a reasonable distance from the pictures.

4. That the quality of daylight should be approximated as nearly as possible.

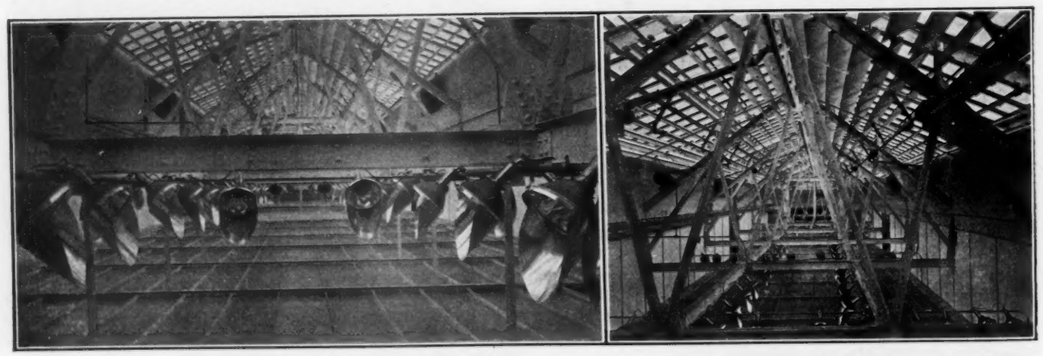
Motor-Operated Daylight Louvres

For controlling the daylight a system of adjustable metal louvres was designed and installed close to the roof skylight. These are operated by electric motors remotely controlled by means of switches placed at convenient points in the galleries. The louvres are divided into two units for each gallery. The unit on the left side of the roof permits light to proceed directly toward the wall on the right side of the gallery and yet does not permit much of the light from the sky or sun to reach the floor of the gallery directly. Each unit is operated by individual electric motor control, and can be turned either forward or backward to obtain the proper position. The individual louvres are 16 in. wide and are hung 12 in. apart, thus providing overlapping which makes it possible to obtain a proper intensity of illumination on the pictures without a strong downward component. It should be noted that the south louvres control the illumination on the north wall and the north louvres that on the south wall. Both sets reduce the amount of light reaching the floor. Inasmuch as in such a room in the daytime relative illumination intensities are of chief importance, it is interesting to note that on a clear day the south wall, which receives no direct sunlight, approximately represents the results that would be obtained on an overcast day on any wall in the room.

Adjustable Artificial Units

In order to approximate natural daylight, Mazda C-2 ("daylight") lamps were used with projector units (X-ray reflectors No. 800) placed above the sub-skylight. A special holder was designed by means of which it was possible to adjust each unit to the desired angular and focal positions. One lighting unit was provided for each 3 ft. or 4 ft. of wall length. In order to obtain satisfactory uniformity of illumination on the principal wall area it was necessary to adjust the units very carefully, therefore the lamps, which were 150-watt Mazda C-2 units, were slightly frosted with an etching solution. Scoops were attached to the reflectors to intercept direct light from the lamps.

The court of tapestries and armor is the largest and most impressive of the galleries in the museum. The



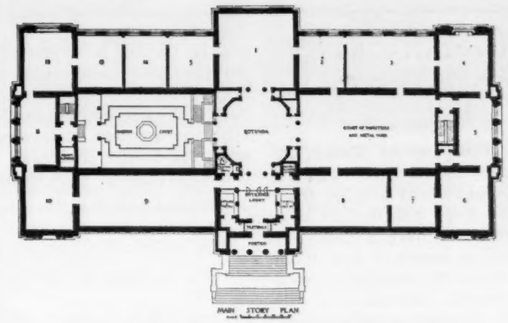
"DAYLIGHT" LAMPS WITH HOODED REFLECTORS FOR NIGHT LIGHTING, AND MOTOR-OPERATED LOUVRES FOR CONTROLLING NATURAL ILLUMINATION, IN ATTIC SPACE ABOVE OVERHEAD-LIGHTED PAINTINGS GALLERIES

gray stone walls hung with banners and tapestries form a fitting background for the horsemen and guards in armor. To provide a system of lighting which in itself would be satisfying to the eye and harmonious with the surroundings, also effective in illuminating the exhibits, the following requirements were formulated:

1. That the sub-skylight present an appearance of uniform brightness both by day and by night.

2. That the intensity in all parts of the room where exhibits are located should be at least 2 foot-candles.

3. That the maximum intensity of illumination should occur in the center of the room to accentuate the group of horsemen which forms the principal object of interest in the court.



PLAN OF THE CLEVELAND MUSEUM OF ART

It was necessary to choose a glass which would break up the light rays to a considerable degree, and it was found that when the somewhat uneven surface of commercial wired glass was deeply etched the diffusion was sufficient so that a uniform brightness of the skylight could be secured and at the same time the shadows of the beams were not visible. The dimensions of the skylight are 30 ft. by 72 ft., hence eight rows of twenty units each were required to illuminate it. In addition sixty outlets were provided beyond the edge of the skylight and completely surrounding it, to preserve the appearance of uniformity to the outermost panel of glass, even when viewed from the opposite side of the court. From the standpoint of efficient lighting, of course, it was desirable so far as possible to place large units over the center of the area. Thirty-two of the central outlets were each equipped with 150-watt lamps and concentrating mirrored glass reflectors (X-ray No. 710). These outlets were depended upon for the greater part of the illumination and the remaining outlets were therefore equipped with distributing reflectors (Ivanhoe BED-60) and the smallest size of daylight lamps obtainable. The intensity of illumination on a horizontal plane varies from 5 foot-candles in the center of the room to slightly less than 2 foot-candles near the corners.

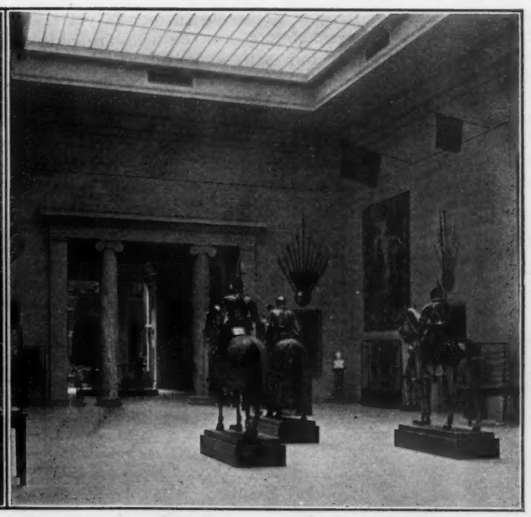
Lighting the Garden Court

In the artificial lighting of the garden court, it was decided to produce the effect of an outdoor garden at night. To accomplish this it was necessary to have the ceiling as dark as possible. The main lighting is accomplished with four lantern units on posts. The lanterns have a strong horizontal and downward component, with a relatively small amount of flux in the upper hemisphere. The lanterns are paneled, making it possible, by choice of glass, to reduce the brilliancy of the units in any desired directions. As installed, these are provided with dense glass on the sides which come into the line of vision of visitors passing through the court. One 300-watt Mazda C-2 lamp is used in each of these units.

The loggia, on the west end of the garden court, is illuminated from overhead to an intensity higher than that prevailing in the court.

Special provision is also made for the illumination of the central fountain. With a lighting system to give the desired night effect in the court, it was difficult, without special provision, to avoid the appearance of a dark basin. This special illumination is obtained from above the skylight, directly above the fountain, by means of a lens system like that of the ordinary stereopticon lantern. An aperture the exact shape of the fountain was cut in an opaque slide so that this can be focused by the lens to exactly cover the area of the fountain. In this way it has been possible to provide illumination with an absolutely sharp line of demarkation and from a concealed source.

THE GARDEN COURT, WITH ITS POST LANTERNS AND ILLUMINATED LOGGIA AND CENTRAL FOUNTAIN



THE COURT OF TAPESTRIES. A MAXIMUM INTENSITY IS CENTERED ON THE GROUP OF HORSEMEN

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

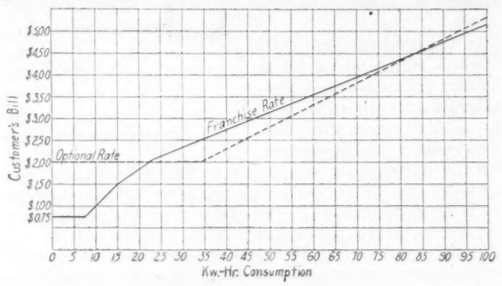
WHEN A WOMAN MANAGES

Three Interesting Instances of the "Public-Be-Pleased" Policies of the Frankfort (Mich.) Company, Managed by Mrs. E. L. Johnson

The Benzie County Power Company of Frankfort, Mich., came into existence only a few years ago by building a small water-power plant about 6 miles from Frankfort, and purchasing the local distribution system and bringing energy into town over a 2300-volt transmission line. Its predecessor company had given night service only, and had billed its customers on a flat-rate basis of so much a month, regardless of the amount of energy used. This flat-rate privilege had, however, been greatly abused by some of the customers, and when the new company metered every customer there was a wave of complaint and dissatisfaction, and serious opposition to the new corporation. After six months of this "kicking" on the part of customers and prospective customers, Mrs. E. L. Johnson, manager of the property, worked out a rate which would approximate this old flat rate as nearly as possible in nature and still be fair to customers buying power on the franchise rate. She called this new rate an "optional rate" and introduced it to the public as "an acceptable substitute for a flat rate on electric house service to meet the frequent requests for a flat rate, which is manifestly impracticable." The franchise rate was as follows:

Ten cents for the first 15 kw.-hr.; 7 cents for the next 8 kw.-hr., and 4 cents for all used thereafter, and a minimum charge of 75 cents. The optional rate was made 7 cents for the first 15 kw.-hr., and 5 cents for all thereafter, with a minimum charge of $2 a month. As seen in the accompanying curve, this optional rate was arranged so that while it gave some advantage to users of between 23 kw.-hr. and 84 kw.-hr. a month, yet the large consumers purchasing power on the franchise rate received a lesser bill with a consumption above 84 kw.-hr., the crossing point of the two curves, than the optional rate customer would have obtained for equal consumption.

In the announcement of the optional rate, the people's attention was called to the fact that for those who cared to adopt it, the new rate would give them one-half more energy for the same money, as shown by the fact that for the $2 minimum charge, 34 kw.-hr. could be used as against only 23 kw.-hr. for $2.06 on the franchise rate. It was anticipated in making this concession that the smaller customers adopting the rates would endeavor to use their full allowance of current under the $2 minimum each month, and that the plan would

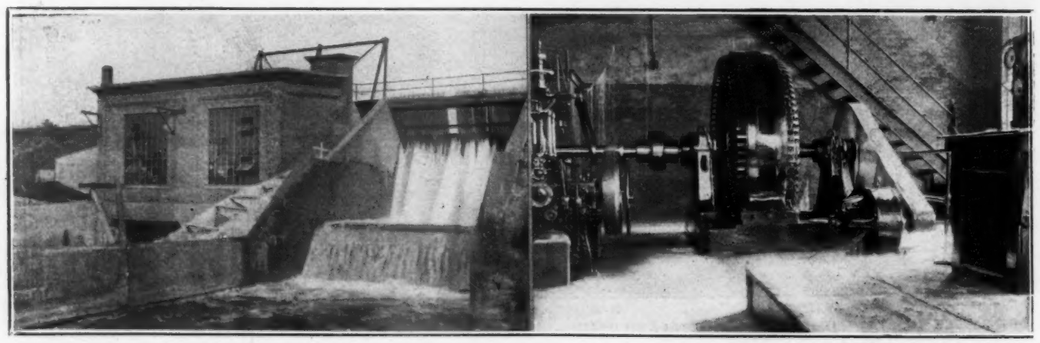


CURVES COMPARING THE FRANCHISE RATE AND THE OPTIONAL RATE DEVISED BY MRS. JOHNSON

thus stimulate generally the sale and use of electrical appliances; and it has worked out this way to a certain extent. The optional rate has been chosen by a number of the customers and has seemed to mitigate almost completely the feeling against the metered service and the company. No customers taking this rate have given it up. Incidentally, it is valuable to the company, as it tends to make the income from lighting more nearly uniform throughout the year, or to lessen the summer valley in the income curve.

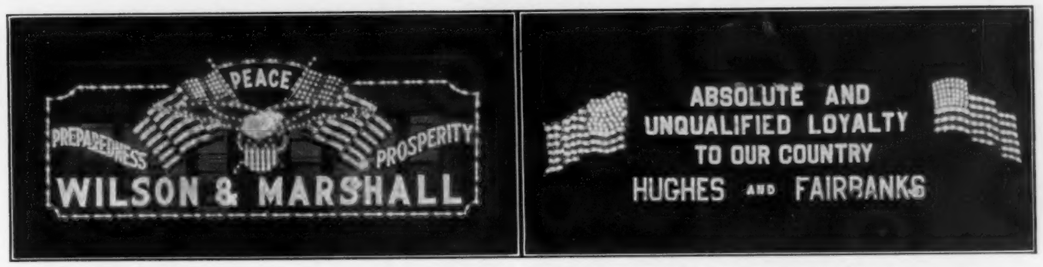
Handling Summer-Resort Business

In this matter of rates, Mrs. Johnson has also established a policy of handling summer-resort business which has proved satisfactory. On the shores all around Crystal Lake, the beautiful 11-mile long lake at Frankfort, hundreds of summer cottages—some of very pretentious nature—are located, and the demand among the cottages for electric lights has been quite general. Mrs. Johnson has established a minimum charge of $6 for the three summer months, which must be paid



WATERPOWER PLANT AND WATERWHEEL-DRIVEN GENERATOR OF THE BENZIE COUNTY POWER COMPANY NEAR FRANKFORT, MICH.

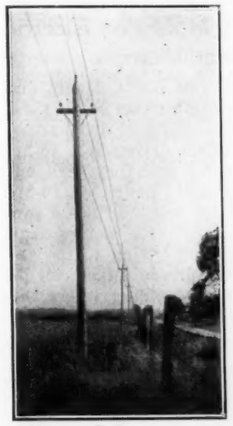
Enlisting the Electric Sign in the Presidential Campaign



Astute campaign managers in all the political parties have this year been particularly alive to the possibilities of impressing the names of their candidates on the attention of the voting public by means of electric signs. In size and costliness, these displays vary all the way from great flashing set-pieces like those pictured above, to the "winking" frosted globes, painted with national or local candidates' names, which grace corner windows.

The big sign shown at the left, marks the national headquarters of one party, at the corner of Forty-second Street and Madison Avenue, New York City. The other display is made by the Union League Club in Fifth Avenue.

if service is required during any portion of the period. The meter rate is 12 cents for the first 20 kw.-hr. and 6 cents for all over that. This charge basis has proved satisfactory and profitable. The investment charge against the resort business has been kept down by transferring transformers from their summer locations to service in town in the winter, as further transformer installations are needed, instead of purchasing new apparatus. This, of course, makes it necessary to place new transformers for the summer-resort business the following year, but by the time this season is over there usually is use for these new ones in the city again, and the cost of making the installation changes is very low in this small company. This keeps the total transformer investment down to a minimum and reduces the overhead charge against the resort business.



THE 2300-VOLT TRANSMISSION LINE

Furnishing Service to Neighboring Town

Another incident which furnishes an interesting example of the liberal yet successful policy of Mrs. Johnson is that of supplying service to the neighboring town of Bear Lake, with a population of 500. The people of the village had appealed to her for service, and as this entailed the construction of 14 miles of transmission line, it was rather doubtful whether the expenditure could be justified by the returns. The matter was put up to the directors and rejected, but the people of Bear Lake entreated and Mrs. Johnson figured some more and finally gained the consent of her board to go ahead, but it was to be emphatically her venture. Upon notification of the intent of the company to serve them, Bear Lake marshalled its forces, including twenty-eight teams, and drew poles and helped in every way the company would let them, with the result that a three-phase wood-pole transmission line was built at a cost of only $425 a mile. Besides this $6,000 total investment for line, an additional $3,000 investment was made in local distribution system. Upon completion of the line and the turning on of electric street lights, Bear Lake had a great celebration. There were fifty customers to begin the service in the town, and at the time of this writing, the franchise has been in operation a year and three months, the number of customers has more than doubled, and the returns the first year have amply justified the investment. The rate for energy is the same as in Frankfort—10, 7 and 4 cents—but with a minimum bill of $1 instead of 75 cents. Collections are made through the local banker here, and also in Beulah, Elberta and Benzonia, other towns served by the company, as Mrs. Johnson thinks the people feel more compunction about paying promptly when a bank is doing the collecting.

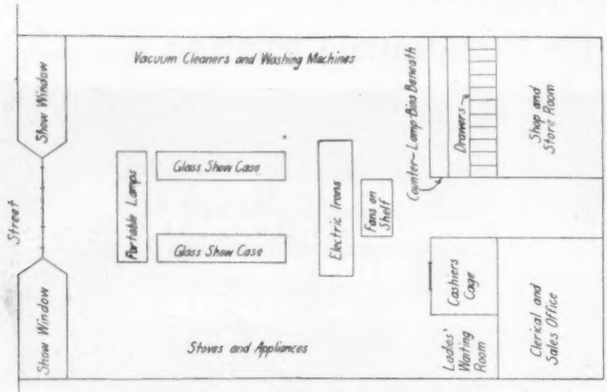
So it was that Mrs. Johnson's venture proved to be a paying investment and won for her the best of goodwill from the people of Bear Lake, who had keenly felt the absence of electricity. The effort on Mrs. Johnson's part to connect up the village is only an example of her eagerness to find more places to sell the surplus energy available from the 375-kva. Westinghouse unit with plentiful water going to waste, and her activities to bring new industries to Frankfort have been more successful than those of the whole village council, as attested by one manufacturer who is planning now to locate there.

Display-Room Arrangement in Maywood Office of Public Service Company of Northern Illinois

In Maywood, a city of 8500 inhabitants, which is really a suburb of Chicago, the Public Service Company of Northern Illinois has established a branch office to care for its users of both electricity and gas. While this local office does not represent the ultimate solution of all the company's suburban office problems, it embodies some interesting features. The Maywood office is located on the main street of the suburb in what is perhaps the little town's best business building. It has a 36-ft. front and is 60 ft. deep.

The backgrounds of its spacious show windows, which are 7 ft. deep, are changed with each week's display. As the visitor enters the store through a center entrance his first glance must rest on a group of portable lamps on a table. Passing back through the store to the cashier's cage through either of the side aisles, appliances are displayed for sale on both sides.

One of the recognized principles in arranging the stock is that the entire line of any one device must be grouped. It is thought to be poor policy to have the



PLAN SHOWING ARRANGEMENT OF MAYWOOD (ILL.) CENTRAL-STATION OFFICE

customer walk all over the store to show him a few different types of toasters. Liberal but not excessive use is made of neatly lettered placards calling attention to devices and mentioning sales points. The methods of dressing show cases used in drug stores and hardware stores are watched carefully, and appealing ideas thus secured are applied with "electrical variations" in the appliance store.

The actual number of the company's customers in Maywood is 2014, but people from neighboring suburbs also use this office. The total revenue from both electricity and gas which the office handles amounts to about $15,000 a month. Of this amount about $1500 represents merchandise sales. In equipping this room with its tables for portable lamps and fans, its glass show cases for small heating devices, its shelves for lamps, its clearly labeled and price-tagged drawers for fuses and fittings, and its ampel side space for washing machines, vacuum cleaners and gas stoves, an earnest effort has been made to produce a real store—not a mere display room.

Office Lighting by "Daylight" Lamps

"Daylight" gas-filled tungsten lamps have been employed in the new lighting fixtures in the banking department of H. L. Doherty & Company, New York City, which is lighted by twenty-four of the bowl units shown, each containing five 100-watt Mazda C-2 lamps. The fixtures were designed and located to minimize shadows and to deliver the maximum illumination onto the working plane 30 in. above the floor. At the same time sufficient light flux passes through the glass-top panels to light the ceilings and side walls and provide good general illumination. Emphasis is placed on the claim that the light from "daylight" lamps, which in color closely simulate natural light, for office lighting minimizes eyestrain incidental to artificial illumination of the ordinary color characteristics.

BANKING OFFICE LIGHTED BY "DAYLIGHT" UNITS. EACH FIXTURE CONTAINS FIVE 100-WATT LAMPS

First Cost of and Savings Effected by Gas-Filled Street Lamps in Indiana Cities

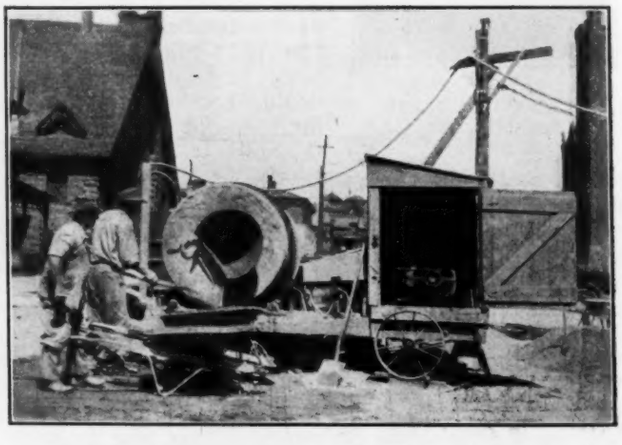
The Northern Indiana Gas & Electric Company, which has headquarters at Hammond, Ind., recently converted its 450-watt alternating-current 6.6-amp. series-arc street lighting equipment in the Indiana cities of Hammond, East Chicago and Michigan City, to 400-cp. 234-watt gas-filled incandescent units. The cost of installing the new lamps averaged $18.75 per unit, and the cost of their maintenance is estimated at about $12.50 per lamp per year, which represents a saving of $2.50 over the former arc units that cost $15 a year to maintain. The following figures show the systems converted, and the contract rates for the old and new services:

	Hammond	East Chicago	Michigan City
Number of lamps	395	228	228
Rate old system, per lamp per year	$60.00	$80.00	$75.00
Rate new system, per lamp per year	$52.50	$57.50	$57.50

The annual energy consumption was meanwhile reduced from 1800 kw.-hr. per lamp for the arc units to 936-kw.-hr. per lamp for the present gas-filled incandescent units.

General Contractor Saves Money on Electric Drive for Cement Mixer

Nelson & Pederson, contractors of Butte, Mont., find that electric drive for their concrete mixer saves them about $150 a month over any other form of drive previously used. With a ½-cu. yd. mixer driven by a 15-hp. Westinghouse alternating-current motor they turn out 80 cu. yd. of concrete per day of eight hours. A 10-hp. motor operates a hoist and a 5-hp. motor drives a saw for cutting lumber. Energy for the three motors costs the contractor only $30 per month. Owing to the absence of steam and oil the motor-driven mixer can be used inside the finished walls of a building where the use of steam or gasoline-driven apparatus would be out of the question.



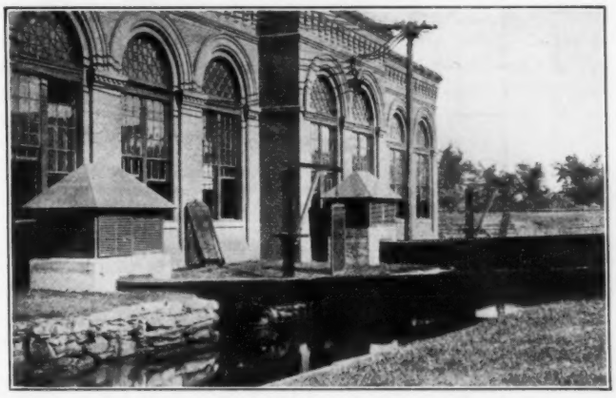
THIS CEMENT MIXER, OPERATED BY A 15-HP. MOTOR, SAVES THE CONTRACTOR $150 A MONTH

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

A Turbine Plant That Does Not Require Circulating Pumps

At the Millbury (Mass.) steam generating plant of the Worcester Consolidated Street Railway condensing water is delivered by gravity, the usual circulating pumps being absent. The condenser intakes are connected with the canal shown in the accompanying illustration, this canal being a branch of the Blackstone River diverted from the main stream a few hundred



TWO GENERATOR AIR INTAKE HOUSES AND CRANES FOR RAISING CONDENSER INTAKE SCREENS

feet above the station. Two 5000-kw. steam turbines are installed and the head available on the condenser tubes is about 6 ft. Provision is made for screening the intakes as shown, each intake being provided with a duplicate set of screens raised and lowered from the intake mouth by a windlass crane easily operated by hand. In connection with the rebuilding of the station to accommodate turbines in place of former reciprocating engines, a switch house was erected on one side of the canal and the cables from the generators and auxiliary machinery associated with the a. c. system of transmission to the Worcester substation were carried across the canal in the reinforced concrete ducts as illustrated. These ducts pass through the bottoms of two intake shelters arranged to admit the air supply for generator ventilation. Dampers are provided inside the station to enable the discharged air from the generators to be used over and over when desirable.

Operating and Cost Data for Electric Railway Power Stations

The data in the accompanying table are a summary of similar information compiled for seven electric railway power stations by the power generation committee of the American Electric Railway Engineering Association and presented in its report at the convention held at Atlantic City, N. J., Oct. 9-13, 1916. The information was secured from typical power stations in various parts of the country, some of which employ large modern turbines, others combined low-pressure turbines and reciprocating engines, and still others all reciprocating engines. The range in rating is from 6000 kw. to 65,000 kw. The committee pointed out in presenting this data that to obtain a fair comparison of operating efficiencies and costs which may be generally applied, a much greater amount of information should be obtained in each case, such as daily load curves, labor costs for various classes of work, facilities for receiving and disposing of coal and water, cooling water limitations, etc. The data, however, gives in a general way the tendencies in regard to electric railway station performance under varying conditions of load factor, fuel cost and types of equipment.

In commenting upon this data, L. P. Crecelius, Cleveland (Ohio) Railway Company pointed out that there is less than 5 per cent difference in expense between the operation of the best modern turbine plant, according to data furnished by the committee, and that of an old direct-current engine plant. The reason

STEAM PLANT OPERATING AND COST DATA FOR DIFFERENT TYPES OF EQUIPMENT

Operating and Cost Items	Modern Turbines					All Engines				Low Pressure Turbines and Engines
Plant Number	1	2	3	4	Average	1	2	3	Average	
Net output from bus, kw.-hr.	130,076,945	111,082,725	91,402,690	172,927,100	126,372,365	41,304,359	43,314,700	44,988,468	43,202,509	68,841,300
Maximum one-hour peak, kw.-hr.	42,000	33,240	23,000	46,100	38,085	13,900	8,500	11,050	11,150	13,000
Capacity for two-hour peak, kw.	45,000	37,000	44,700	65,700	48,100	16,875	6,400	11,000	11,425	11,750
Plant factor—average kw.-hr. to two-hour rating	0.33	0.34	0.234	0.30	0.30	0.28	.....	0.467	0.373	.....
Load factor, one hour to average kw.-hr.	0.35	0.38	0.453	0.428	0.403	0.330	0.58	0.465	0.461	0.604
Pounds of coal per kw.-hr.	1.75	1.97	2.78	2.48	2.245	2.58	4.19	3.90	3.56	3.21
B.t.u. as received	14,459	14,250	13,000	13,300	13,752	14,165	13,100	12,530	13,265	13,300
B.t.u. per kilowatt-hour	25,300	28,100	36,200	33,232	30,708	36,400	54,889	48,801	46,697	42,693
Management and care, total	$410,810.20	$397,739.49	$261,734.16	.....	$356,761.28	$233,089.52	.....	$240,679.83	$236,884.67	.....
Management and care, in per cent:										
Buildings	0.41	0.27	0.14	0.99	0.45	0.28	0.57	0.41	0.42	3.044
Maintenance	3.91	7.25	7.55	11.30	7.50	8.81	8.96	9.59	9.12	17.142
Wages	8.81	7.25	15.61	17.60	12.32	16.10	20.30	21.57	19.32	24.007
Fuel for power	84.58	83.84	72.48	64.30	76.30	66.50	55.40	60.77	60.89	49.982
Water for steam	0.78	....	0.00	0.62	0.47	5.60	11.37	3.41	6.79	3.016
Lubricants	0.17	0.61	0.79	1.10	0.67	1.14	1.54	2.70	1.79	0.906
Miscellaneous supplies	1.34	0.78	3.43	4.07	2.41	1.57	1.82	1.55	1.67	1.803
Total of above accounts	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.000
Total cost per kw.-hr.	$0.00316	$0.00358	$0.00286	0.578*	.....	$0.00570	2.31*	$0.00535	.....	1.45*
Fuel cost per kw.-hr.	.00267	.00300	.00207	.372*	.....	.00370	1.28*	.....	.....	0.726*
Labor cost per kw.-hr.	0.00028	0.00026	0.00045	0.102*	.....	0.00091	0.468*	.....	.....	0.349*

*Millionths of 1 per cent.

given was that most of the remaining power stations of this character were built fifteen to eighteen years ago and located without suitable regard for water facilities. It was of prime importance to locate these stations more with regard to accommodating the low-tension distribution systems because of the restriction imposed by the 600-volt equipment. The range of usefulness of this type of plant was limited to a radius of less than 15,000 ft., making it impossible to serve the average railway system from a single plant. The rating of such plants was confined to about 1200 kw. The addition of low-pressure turbines coupled to direct-current generators has in a few cases prolonged somewhat the effective life of such plants, but taken as a whole, the continued expansion and growth of electric railway systems has outdistanced this type of station because of its inflexibility.

Distribution of Employees in Departments of a Central Station

Since around 25 per cent of the total expense of operating electric service systems is usually represented by labor, the division of employees among the different departments of companies which have made every effort to reduce this expense should be studied. In the Union Electric Light & Power Company for example, which operates in St. Louis, Mo., a city of 687,029 inhabitants, 964 employees are engaged in addition to the department heads and officials of the company, according to a recent issue of *Wire & Pipe*, the official organ of the company. Of these employees about 49 per cent are engaged in the engineering, operating and distributing departments, 21 per cent in the utilization and trouble

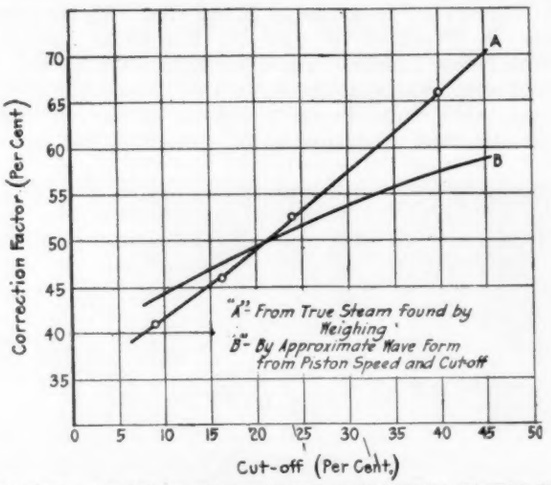
GRAPHICAL REPRESENTATION OF NUMBER OF EMPLOYEES IN DIFFERENT DEPARTMENTS OF A CENTRAL STATION

departments, 19 per cent in the sales and billing departments, 8 per cent in the steam heating department, and 3 per cent for other purposes. A more detailed division of employees among the departments is given in the accompanying chart. Standing out prominently in the first group given as regards numbers of employees are the electrical, purchasing and drafting departments, using 12 per cent of the total employees. Station and substation operation requires 19 per cent of the employees, while the installation, overhead and underground departments require a number which is 18 per cent.

STEAM-FLOW METER APPLIED TO RECIPROCATING ENGINES

Results of Investigation to Determine a Correction Factor for Steam-Flow Meters When Measuring Pulsating Flow

Except where surface condensers are used there has been no direct way of measuring the steam consumption of reciprocating engines other than to apply some factor to the indicator card. Because of the wide variation in leakage steam, however, the latter method has practically no value. In view of these limitations, Victor B. Phillips, engineering assistant, Cleveland (Ohio)



RELATION OF STEAM-FLOW METER CORRECTION FACTOR TO CUT-OFF

Railway Company recently investigated the possibility of using steam-flow meters in connection with measuring the consumption of some large reciprocating engines.

Since the meters generally used are designed for steady, uniform flow, it was obvious at the outset that some correction would have to be made for the pulsating flow existing with reciprocating engines. Owing to the complexity of the pulsation wave forms and difficulties incident to determining them, it was impracticable to determine the average velocity from wave analysis. It may be pointed out, however, that an attempt was made to approximate the wave forms from the instantaneous piston speeds for various cut-offs, but the constant determined therewith varied considerably from the actual constants, as shown by the above curves.

The next step taken in applying the steam-flow meter to reciprocating engines was to effectively damp out the pulsating motion in the mercury columns of the meter. This was accomplished by introducing short lengths of glass capillary tubing, thus restricting the movement of the columns due to intermittency of flow, but not affecting instantaneous response to smallest changes in load. Since the meters had to be used in connection with large units, only a comparatively small amount of empirical data was required to determine the correction factor, as the number of distinctly different types of engines and of different pipe sizes and relations was exceedingly limited. Accordingly, the meter was connected in the high-pressure pipe leading to a 1200-kw. Robert Wetherill engine operating on a surface condenser, and the condensate weighed at different loads and cut-offs. In this way, the relation between correction factor and cut-off was established. The meter was then applied to a 1600-kw. C. G. Cooper engine operating non-condensing and the relation between load and cut-off was determined. It was then assumed that for the same percentages of cut-off the correction factor was the same for both engines, thus giving a basis on

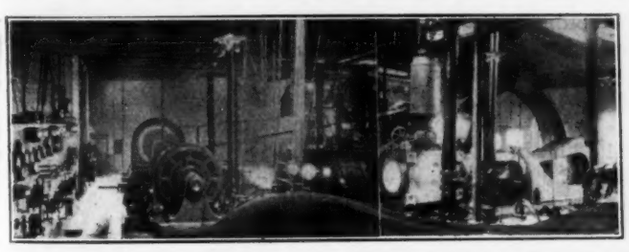
which to calculate the steam consumption of the non-condensing engine. Later, the steam consumption of an entire non-condensing plant determined in general by this method was closely checked by exceedingly exhaustive and careful heat balances, and the discrepancy was found to be less than 2 per cent. In commenting on this investigation Mr. Phillips declared that he does not propose the general application of steam-flow meters to measure pulsating flow, but merely suggests this method to encourage further investigation.

Closing Rotary Converter Switches After Short-Circuit

In a recent number of the official organ of the Consumers' Power Company, Jackson, Mich., attention is called to the importance of observing the voltage on a rotary converter or motor-generator set after a short-circuit. In such a case a rotary converter or direct-current generator is liable to build up with a reverse polarity. While this does not happen in every case, it should be guarded against, since with reverse polarity the voltage on the machine would be doubled and serious results might ensue.

Use of Wood Refuse from Lumber Mill and Exhaust Steam as By-Products

When the refuse from sawmills was first utilized as fuel under boilers supplying steam to electric generating equipment, instead of burning it to be rid of the accumulation it seemed like getting something for nothing. Another step in the progress of economy is found, however, in the operation of the plant of the Stearns Light & Power Company of Ludington, Mich., where the refuse from the Stearns Salt & Lumber Company is burned under the latter company's boilers, the energy generated sold to the central station company, and the exhaust steam from the generating units used in the process of evaporating out salt from brine. During part of the year all the exhaust steam is used in evaporating salt, but at other times there is a surplus of exhaust steam, and in order to utilize this, a mixed-pressure turbine is installed in the plant with the steam piping so arranged that the exhaust may be sent to either the salt grainers or to this turbine. When the



GENERATING EQUIPMENT IN A MICHIGAN PLANT WHERE BOTH WOOD FUEL AND EXHAUST STEAM ARE EFFECTIVELY UTILIZED

station is running under full load during the winter peak, it is necessary to use some coal, but this is kept to a minimum by cutting off all the exhaust steam from the salt grainers during heavy load hours and utilizing all exhaust in the turbine. This is feasible because of the large quantity of salt stored, making it possible to shut down the salt plant to get the most advantageous use of the steam, and thus keep down the investment in generating equipment.

The wood refuse is burned in dutch-oven furnaces under three 400-hp. and three 250-hp. Wickes water-tube boilers, and eight older horizontal tubular 100-hp. boilers generating steam at 125-lb. pressure. Except for the one 600-kw. mixed pressure turbine unit, the generating equipment is all of the simple non-condensing, reciprocating, belt-driven type. The exhaust pressure ranges from 1 to 10 lb., but the amount of this pressure makes little difference in its circulation through the coils in the salt grainers.

All machines in the saw and planing mills which have a connected load of 800 hp. are motor driven. The light and power company also supplies electricity to Ludington and to seven other small towns in that vicinity over a 6600-volt line 13 miles long and a 15,000-volt line 33 miles long. The total customers' load is about 1200 hp. Energy is also supplied to drive the pumps operating the company's vacuum process salt extractor, having a capacity of 1000 barrels a day. An equal amount of salt is produced per day in the open-grainer process plant, which utilizes the exhaust steam.

A Peculiar High Speed Motor Trouble

BY R. L. HERVEY

On one occasion a 500-volt 10-hp. d.c. motor, running at a speed of 3400 r.p.m., continued to open its circuit breakers every time an attempt was made to start it. The wiring contractor, after assuring himself that the connections were correct and that the trouble was inside the motor, refused to give more time to the job. The local representative of the machine company claimed that every machine turned out by his factory was given a twenty-four hour test, therefore the trouble could not be in the motor. The writer was called in to locate the difficulty, with the understanding that the man whose work was at fault was to pay the bill.

The motor was a shunt wound, bipolar design, with two commutating poles. The three leads were marked A. F. and C. which were assumed to mean armature, field and line. After testing out the wiring between the starting box and the motor, the connections were made as stated above. Since the inertia of the machine parts to be started was large and the speed quite high, a large starting current was expected, so that the circuit breakers were set for their maximum current. An effort was made to start the motor to test the connections and also to observe its action when the voltage was applied, an ammeter having been connected in the circuit so that the starting current could be measured. When the starter handle reached the third button the current was 50 amp. The circuit breakers opened and the starter was smoking badly. These results indicated an open field circuit. The internal connections of the motor were checked with considerable difficulty. The lead marked *A* was found to be the line and *C* the armature. After making this change the motor was started again with the same results. The machine representative objected to the motor being taken apart, but yielded to persuasion. A small resistance tube connected in the shunt field circuit was found in the bottom of the frame. While this tube could not be reached for examination, it was suspected of being the cause of the trouble, so a jumper was connected around it. Another effort to start the motor was successful. The motor speed was 3350 r.p.m. with a line voltage of 575. The resistance, after being patched, was connected in the field circuit when the speed measured 3730 r.p.m. As the motor was built for 3400 r.p.m. at 500 volts, it was thought that the factory test was made at that voltage and the resistance put in the field to bring up the speed. Since, however, the voltage was 575 at the place of installation, the speed of 3350 r.p.m. was high enough and as the resistance had open-circuited once, it was decided to leave the resistance out to prevent future trouble.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

A CENTURY OF LIGHT

Development of the Lighting Industry in the Last Hundred Years, with Special Reference to Philadelphia and Street Lighting in that City

IN a recent address Dr. Walton Clark, president of the Franklin Institute of Philadelphia, gave an interesting and suggestive survey of the development of artificial illumination from 1815 to 1915, with special reference to conditions in Philadelphia.

"From the beginning of history to the beginning of our century of light there had been no radical advance in the art of nocturnal illumination. Tapers and lamps consuming oil through a wick were used when the Pyramids of Egypt were built, and tapers and lamps using oil through a wick were—aside from what we call fires—the sole source of artificial illumination at the beginning of our century of light." During the first four decades, from 1815 to 1855, sperm oil and candles were practically the only illuminants used by the average city-dwelling family of moderate means. The householder of average means used about 25 cp.-hr. per night or 9000 cp.-hr. per year, which cost him $22.

The decade from 1855 to 1865 saw the introduction of the kerosene lamp into the homes of people of average means. This resulted at once in an increase of nearly 50 per cent in the amount of illumination without material change in its cost.

The decade from 1865 to 1875 witnessed a very material improvement in the character of the kerosene lamp and a material reduction in the price of kerosene. This is the last decade of the tallow candle as an important factor in the domestic economy of a city-living people of average means. It is also the period in which gas became an important factor in the lighting problem of city people. The candle-hours per year averaged 20,000 to 38,000 per household. The cost per family using kerosene and candles was slightly reduced, and the cost per family beginning to use gas was increased from approximately $23 to $34. Gas during that period sold at $2.50 per 1000 cu. ft.

From 1875 to 1885 kerosene was reduced to 22 cents per gallon, and gas to $2 per 1000 cu. ft. The amount of illumination per year rose to 76,000 cp.-hr. for the average household and the cost was $30. From 1885 to 1895 kerosene dropped to 13.5 cents a gallon and gas to $1.50 per 1000 cu. ft. The greatest improvement was the invention of the Welsbach lamp. The cost of illumination, whether with gas or kerosene, in this period was $25 per year for the average family.

From 1895 kerosene practically disappears from the domestic economy of families of average means in the city of Philadelphia, and gas and electricity took its place; gas at $1 per 1000 cu. ft. and electricity at 10 cents per kilowatt-hour, the gas being used in Welsbach burners and the electrical energy consumed in incandescent 16-cp. carbon lamps. Families of average means using gas from 1895 to 1905 had an illumination of approximately 200,000 cp.-hr. per year at a cost of about $20. Families using electricity during this period had approximately 51,000 cp.-hr. per year for illumination at a cost of approximately $25.

During the last decade of our century, from 1905 to 1915, there has been a notable improvement in Welsbach incandescent gas lamps and a more marked improvement in electric incandescent lamps.

"In the last year of our century, 1915, thrifty families of five people—city residents—and of average financial strength will use for lighting, if with gas, approximately 200,000 cp.-hr. per year, at a cost of approximately $14.50; and a similar family, using electricity for illumination, will probably use 123,000 cp.-hr. per year, at a cost of approximately $17.50. The maximum light in the average household is now approximately 360 candles—about eighteen times the light of a similar household in the earlier decades of our century.

"These somewhat tiresome figures show that coincident with an increase of 1700 per cent in the amount of night lighting, not including firelight, of an American city family, in average circumstances, using gas for light, there has come a reduction in the cost of the year's lighting of 34 per cent, or approximately $7.50 per year; and that the cost of lighting per unit of light —the candle-hour—is now but 2.8 per cent of what it was in the first half of our century. No other necessity of household use has been so cheapened and improved during the century.

"The figures that I have given are my estimate of the amount and of the cost of the nocturnal illumination enjoyed in the households of people of average means dwelling in Philadelphia. They are based in part on the memory of elderly people. They are probably very nearly correct."

Interesting figures are added by Dr. Clark on the development of street lighting in Philadelphia. In 1809 there were 1132 sperm-oil wick lamps (population 58,000); in 1850 there were 1966 gas lamps, using 18-cp. gas Argand burners (population 121,000); in 1885 there were 14,268 gas flat-flame lamps of 17.3 cp., 3360 Maloney naphtha lamps of 14 cp. and 198 open direct-current electric arcs consuming 9.6 amp. at 47 volts (population 950,000); in 1915 there were 24,300 Welsbach gas lamps, 19,987 Welsbach naphtha lamps and 14,635 open direct-current electric arcs consuming 9.6 amp. (population 1,765,810).

The total yearly cost of street lighting to the city was $19,300 in 1809; $43,000 in 1850; $421,000 in 1885; $2,393,000 in 1915. The corresponding candle-power-hours are 8490, 35,388, 491,876, 17,241,359.

The growth in population from 1809 to 1915 was approximately from 60,000 to 1,750,000, or nearly 3000 per cent. The increase in the amount of street lighting was approximately 200,000 per cent. The decrease in cost of street lighting per unit of light was approximately 95 per cent. The increase in the amount of light per capita of population was 6400 per cent, and the increase in cost per capita was 308 per cent. The gas lamps, for which the city does not make a cash payment, are included in these figures at current rates.

Generators, Motors and Transformers

Air-Gap Field of the Polyphase Induction Motor.—F. T. CHAPMAN.—In a continuation of his long mathematical serial on this subject the author takes up the

discussion of the effect of saturation of the magnetic circuit. He gives the saturation curve of a test motor, and states that for practical purposes it may be supposed to contain the fundamental and a third harmonic only, all higher harmonics being negligible. He then begins to give the mathematical theory of the effect of saturation on multiple fields.—London *Electrician*, Sept. 22, 1916.

Mathematical Design of Transformers.—DAVID ROBERTSON.—The first part of a paper giving an outline of the procedure in the mathematical design of transformers. In the present installment the author discusses the data required, the assumptions, symbols, dimensions and efficiency, dimension coefficients, and cost equations. The paper is to be concluded.—From *Journ. of (British) Inst. of Elec. Engrs.*, Vol. 54, page 142, abstracted with diagrams in London *Electrician*, Sept. 29, 1916.

Lamps and Lighting

Luminous Efficiency of the Radiation of the Electric Arc.—ENOCH KARRER.—A note on an investigation carried out in the physical laboratory of the United Gas Improvement Company of Philadelphia, in continuation of the work described in a previous paper on the luminous efficiency of the radiation of the ordinary light sources. In the former paper the ordinary gas and electric light sources were studied. In the present work the electric arcs are the subject of study. The luminous efficiency of the radiation is the fractional part of the total radiation that passes through an absorbing solution whose spectral transmission curve is identical with the luminosity curve of the eye. Proper correction must be made for the absorption by the liquid of the radiation at the wave-length of maximum transmission. Due to the fluctuations in the arc the method previously employed is not satisfactory. By means of two thermopiles the total radiation and the radiation after passing through the solution may be measured approximately simultaneously. The solution employed is not the one employed previously. The cell is one described in detail by Ives and Kingsbury. It consists of a tank 1 cm. thick, containing a solution of copper chloride, potassium chromate and cobalt ammonia sulphate, together with a water tank 2.3 cm. thick to absorb all infrared radiation. Some of the values given for the luminous efficiency are as follows:

	Per Cent
For the ordinary direct-current 110 volt solid carbon arc from	0.34 to 0.97
For luminous yellow flame direct-current cored carbons	4.9 to 7.1
For luminous yellow-flame arc alternating-current	4.1 to 8.3
For yellow flame, homogeneous carbons, alternating-current	11.5 to 22.5
For white flame, homogeneous carbons, alternating-current	6.8 to 7.4
For yellow flame homogeneous carbons, direct-current	18.4 to 19.3
For white flame, homogeneous carbons, direct-current	9.5 to 13.0
For magnetite arc	5.1 to 7.4

All of the measurements were made in a horizontal direction from the arcs.—*Journal Franklin Inst.*, October, 1916.

Generation, Transmission and Distribution

Electric Power Distribution in England.—CHARLES H. MERZ.—A paper read before Section G of the British Association. The compact nature of the British industrial districts and their proximity to each other as compared with those of other countries makes it economically possible to deal with all the power requirements of the community in each industrial area from interconnected electrical power distribution systems tapping all sources of power, however scattered, and delivering electrical energy wherever required. Power undertakings (electric power companies) have been started in most of the industrial areas of England, and if these were developed throughout the country to the same extent as the system which has been for some time in operation on the northeast coast, it is estimated that the resultant economies in coal consumption would, in the near future, amount to 25,000,000 tons per annum, and eventually to 50,000,000 or 60,000,000 tons per annum.

The economical generation of electricity implies the use of the largest possible prime movers and the running of such machines at as steady a load as possible. The possibility of the recovery of by-products (ammonia, benzol, oil) from gas plants is discussed. An urgent matter for settlement is the standardization and unification as rapidly as possible of the frequency and voltage adopted for distribution purposes in neighboring localities. "The question is, who is to pay for this unification? It is not, in general, the fault of the existing undertakings that they have adopted different voltages and frequencies to those in vogue in the surrounding industrial district, though in some cases it must be admitted that it has been their desire to remain isolated, whatever the interests of the country in general and their own consumers in particular. The chief fault lies at the door of the nation itself, the Board of Trade having in the past even encouraged, in some cases, the establishment of different systems in adjacent areas." What is fundamentally and immediately necessary is the establishment of a national electrical trunk mains distribution system.—London *Electrician*, Sept. 22, 1916.

Stokers and Smoke Abatement.—JOSEPH G. WORKER.—An illustrated article on the relation of stokers to smoke abatement, with special reference to the development of the underfed stoker and forced draft.—*Elec. Journal*, October, 1916.

Wires, Wiring and Conduits

Six hundred/1200-volt and 750/1500-volt Direct-Current Change-Over Switches.—H. R. MEYER.—An illustrated article on change-over switches for direct-current

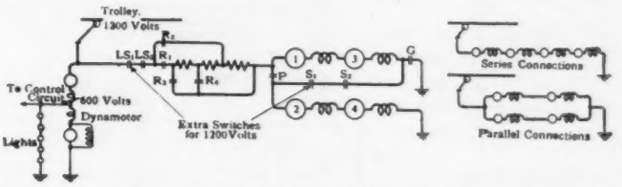


FIG. 1—SCHEMATIC DIAGRAM FOR 1200-VOLT EQUIPMENT WITH HL CONTROL

interurban railway service. Three systems are distinguished. The first is straight 1200 to 1500-volt operation and covers that portion of the railway field where strictly interurban service is contemplated. As no change in speed due to a radical change in voltage is encountered with this system, the connections for the

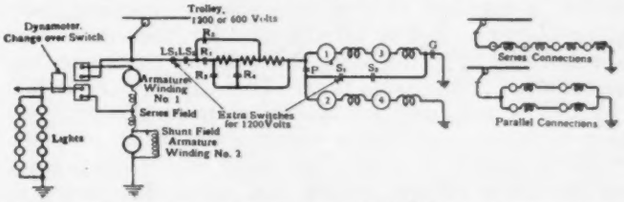


FIG. 2—SCHEMATIC DIAGRAM FOR 600/1200-VOLT EQUIPMENT, WITH HL CONTROL ARRANGED FOR HALF-SPEED OPERATION ON 600-VOLTS

main circuits are arranged as shown in Fig. 1. The second system, for 600/1200-volt or 750/1500-volt operation with half speed of the motors on the lower voltage, includes those roads where a small amount of low-voltage city running is necessary and where fast schedules and close headway are not considered necessary. No change of main circuits is required in this case, and the

connections would be the same as in the first system were it not for the necessity of changes in the auxiliary circuits in order to obtain full voltage on the lamps and control system during low-voltage operation. Connections for this system are shown in Fig. 2. The third system for 600/1200-volt or 750/1500-volt operation, with full speed of the motors on the lower voltage,

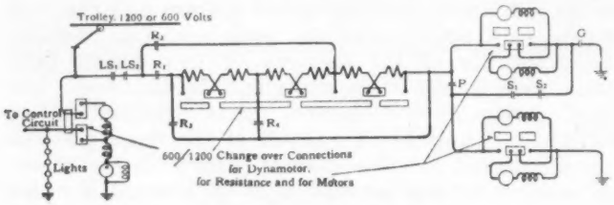

Trolley 1200 or 600 Volts
To Control Circuit
Lights
600/1200 Change over Connections for Dynamotor, for Resistance and for Motors

FIG. 3—SCHEMATIC DIAGRAM FOR 600/1200-VOLT EQUIPMENT WITH HL CONTROL ARRANGED FOR FULL-SPEED OPERATION ON 600 VOLTS

is used if close schedules and headway must be maintained. In order to obtain the same speed in the low-voltage zone as is obtained in the high-voltage zone the circuits are arranged as shown in Fig. 3. By operating at half speed on the low-voltage section the necessity of a main circuit change-over device for rearranging the main circuits is obvious. However, it is essential that the control circuits obtain full voltage on both the low and high sections, and it is almost universally required that the lamps burn at full brilliancy at all times. To obtain the correct arrangement of circuits on both voltages where a dynamotor is used in connection with the compressor or alone, a change-over switch is used, with connections as in Fig. 4. This type of change-over

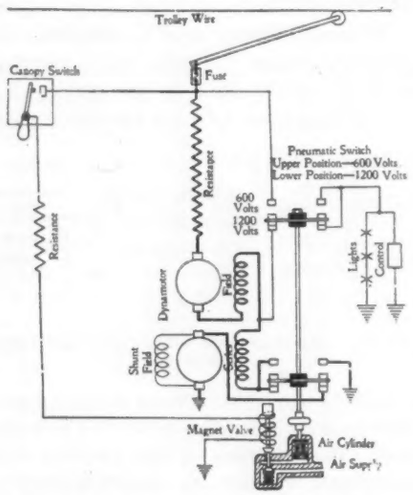


FIG. 4—CONNECTIONS OF CHANGE-OVER SWITCH

switch is operated electropneumatically from the operating platform and is satisfactory for use where cars are operated in trains, since the switches on all cars can be operated at the same time. This change-over switch can also be arranged for use on equipments which employ a double-commutator compressor, which is sometimes necessary to obtain full speed of the compressor on the lower voltage, where half speed does not give the required air pressure. In the construction of this change-over switch an air cylinder is used with an operating magnet. The piston rod of this cylinder assembly is directly connected to a set of contacts and indirectly to a set of fingers which, when in the normal or high-voltage position, connect both sections of the dynamotor in series, and when in the low-voltage position connect both sections in parallel. In the normal or high-voltage position the change-over switch is in the out position and the operating magnet is not energized. When running onto the low-voltage section of the line the operating magnet is energized by means of a control switch located in the motorman's cab. When this coil is energized, air is admitted to the cylinder and the change-over switch is thrown to the in or low-voltage position.—*Elec. Journal,* October, 1916.

Electrophysics and Magnetism

Luminosity of the Positive Column.—H. A. WILSON.—An account of an experimental investigation of the variation of the light emitted by the positive column with the electric current, gas pressure, temperature, and potential gradient, in gases at low pressures.—*Phys. Review,* September, 1916.

Laws Relating Ionization Pressure to the Current in the Corona of Constant Potentials.—EARLE H. WARNER.—An account of an experimental investigation the chief results of which are as follows: The ionization pressure in the positive corona is exactly proportional to the corona current in dry air, hydrogen, nitrogen, carbon dioxide, oxygen, and ammonia. . Any chemical action that takes place due to the corona is exactly proportional to the corona current.—*Phys. Rev.,* September, 1916.

Miscellaneous

Testing; Wages.—GERALD STONEY.—His presidential address to the Engineering Section of the British Association, on engineering problems during and after the war. The author emphasizes the fundamental importance of exact testing. "It is only by accurate testing of existing plant that reliable deduction can be drawn enabling safe progress to be made in future designs. One of the great things which helped forward the steam turbine in the early days was accurate and full testing of each plant as soon as it was completed and before it left the works. The late Mr. Williams was probably the first, or one of the first, to recognize the importance of accurate testing of steam plant, and the success his well-known engine had was largely due to this. From the earliest days of the steam turbine Sir Charles Parons recognized the necessity of such testing, and the test house has always been a prominent feature of Heaton Works. Such methods have enabled the steam turbine to grow from 50 hp. to some 45,000 hp. or more in each unit, and the steam consumption to be reduced to less than one-fifth." Closely allied to such work in engineering works is the general question of scientific research, and here a trained scientific mind is of the utmost importance to see that reliable results are obtained and to make true logical deduction from these results. Such research is generally carried out in four places—engineering works, private laboratories, engineering colleges and national laboratories. . . . "The workman says that he should have his share. What is his share under the present state of things? The average capital expended in an engineering works per individual employed is about $1,000. An investigation the writer made some years ago gave this figure, and it was confirmed by an investigation of shipbuilding yards, which gave $925, and of the census of production, which gives a capital of $7,500,000,000 for 7,000,000 workers, or $1,071 per man. An investigation of the dividends paid shows them to be about 4 per cent on the capital employed. Here it must be remembered that firms paying 10 to 15 per cent on their ordinary capital have often a large preference and debenture capital, on which a much lower rate of interest is paid, and also that often part of the ordinary capital was issued at a premium. Also account has to be taken of the large number of companies that do not pay any dividend on their ordinary stock, and often none on their preference. Little is, as a rule, heard of the finances of such companies; it is the ones paying good dividends

that public attention is drawn to. It thus means that the shareholders get about $40 per year per individual employed. On the other hand, the average wages for men and boys, skilled and unskilled, is about $350 per annum in normal times. This means that the worker gets between eight and nine times as much as the capitalist, and shows on what a very small margin the capitalist works. And without the capitalist, under our present system of individualism, there would be no factories erected and run, and therefore no work for the working man, a thing it is well for him to remember, and also that without profits the capitalist will not invest in engineering and other works in this country, but will seek for a more profitable field for his capital elsewhere. Every $1,000 invested in this country in a factory means work and livelihood for one British working man."—London *Electrician*, Sept. 8, 1916.

British Association.—An account of the recent meeting of the British Association for the Advancement of Science at Newcastle, with brief notes on the principal papers presented and discussions.—London *Electrician*, Sept. 15, 1916.

Readers' Views and Comments

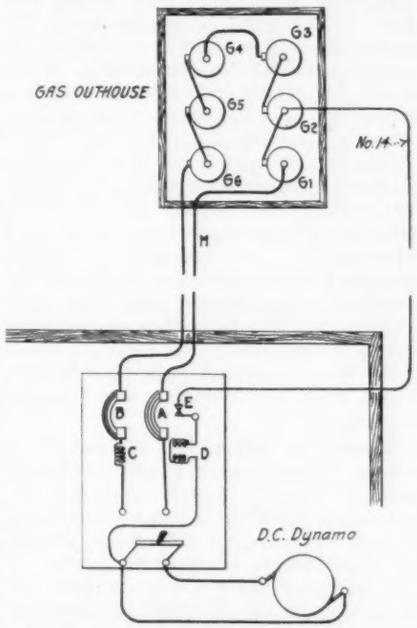
Electrical Protection of Electrolytic Oxygen and Hydrogen Generators

To the Editor of ELECTRICAL WORLD:

SIR: A recent effort to secure the most complete, practicable protection for a battery of electrolytic oxygen and hydrogen generators, against any possibility of reversal of current, seems to show that this subject has not had the attention it deserves, either on the part of the manufacturers of circuit breakers, or the makers of gas cells. During the past year, several fatal accidents have occurred in this country, and this danger should be brought to the attention of every engineer having an electrolytic gas plant under his supervision.

The danger to which a reversal of current will expose an electrolytic gas plant, needs only to be mentioned to be instantly appreciated. It means that the piping and tanks will contain an explosive mixture, which stands an excellent chance of being ignited. No matter what the source of current may be, it is possible to imagine circumstances which might arise and cause a reversal of current through a battery of gas cells. Practically without exception, gas cells are located in a small building devoted solely to them, and to which a pair of cables to supply the current must run some distance. An accident to this circuit or some other construction work, may make it necessary to remove the cables temporarily, as was the case in one plant, and in the haste to get the gas generators in operation again, a mistake may be made and the wires reversed. In addition to this possibility, which exists in every plant, there is, in many cases, the chance of the source of power changing its polarity. This danger is greatest if the current is supplied from a self-excited dynamo with a series winding for compounding or commutating. A bank of gas cells will, to a slight extent, act like a storage battery and give off current in the reverse direction for several minutes; so that if the dynamo is ever stopped without first opening the switch to the gas cells, enough current will discharge through the series field to cause a reversal of the residual magnetism and hence cause the dynamo to build up its voltage in the opposite direction when next started. Separate excitation is safer, but even under those circumstances reversals have been known to occur.

The accompanying diagram shows an arrangement which gives complete protection against reversal, even that which might be caused by a mistake in altering the wiring, unless the plant should be entirely dismantled, moved and set up again, in which case, of course, care must be taken to start it right. The gas cells *G* are shown located in an out-house and supplied by the mains *M* from a suitable low voltage d.c. dynamo. From the second gas cell *G2* a No. 14 wire is run back to the circuit breaker *AB* on the dynamo panel. This wire should be run with the lighting wires and by a route other than that used by the mains *M*, so that they are unlikely to be disturbed at the same time or for the same cause.



CONNECTIONS OF CIRCUIT BREAKER AND GAS CELLS TO PREVENT REVERSAL OF CURRENT

The circuit breaker used should operate on overload, low voltage, and reversal of voltage. It must depend upon a permanent magnet to operate the reverse voltage trip, and it must be so constructed that the permanent magnet cannot by any chance have its magnetism reversed. As shown in the diagram, *A* and *B* are the two poles; *C*, the overload coil; *D*, the shunt coil; and *E*, an auxiliary switch operated by the pole *A*. Hence in starting, it is necessary to close pole *A* first. The object of the low voltage release feature is, of course, to make certain that any break in the wiring will at once open the breaker and make it impossible to run without the reverse voltage protection. The ordinary reverse current circuit breaker could give no protection since its operation depends on the relation of current to voltage, and it would not open and refuse to stay closed if both current and voltage reverse, as is the case on gas cells. A current relay might be used to operate a "shunt trip" circuit breaker but it is never quite safe in emergency apparatus to depend on small relay contacts closing a circuit in order to throw open a breaker. Furthermore, the ideal place for the shunt of the current relay is in the connection between cells *G1* and *G2*, but then the two leads running back from this shunt to the relay would be liable to breakage, and would be without the low voltage protection afforded by the other arrangement.

The arrangement shown by the diagram, with the reverse voltage and low voltage circuit breaker, gives as complete protection as could be asked for and seems to be the best solution using standard apparatus.

A. J. ACKER.

East Orange, N. J.

Change in Formula for Inductance of Three Strand Conductor

To the Editor of ELECTRICAL WORLD:

SIR: In the expression for the inductance of a three-strand conductor which appeared in the article by the writer and Winfield Eckley in the Oct. 14, 1916, issue of the ELECTRICAL WORLD, the term which reads $2 \log_e \left(\frac{2\sqrt{3}+3}{3}\right)$ on page 761 in the formula eleven lines from the top of the first column should be changed to read, $2 \log_e \left(\frac{2\sqrt{3}+3}{3}\right)$. The formula in the fourth line from the bottom of the same column would then be as follows:

$$L = 2 \log_e \frac{s}{2.153r} + \frac{\mu}{6} + 2 \log_e \left(\frac{2\sqrt{3}+3}{3}\right) - \frac{4}{3} \log_e 2 \text{ per cm.}$$

CHARLES E. OAKES.

Ithaca, N. Y.

W. H. Thomson, general manager of the Kansas City Light & Power Company, has handed in his resignation to take effect at once.

Burdette C. Thayer has been appointed by the Metropolitan Water & Sewerage Board of Boston, Mass., to be superintendent of the power plants operated by the commission.

Alfred L. Kenyon, formerly local manager of the Alabama Power Company at Anniston, Ala., has assumed the position of general manager of the Columbia (S. C.) Railway, Gas & Electric Company.

H. F. Heyman, who was recently appointed manager of the Electric Service Company at Orrville, Ohio, was formerly a member of the commercial department of the Toledo Railways & Light Company, Toledo, Ohio.

Claiborne Pirtle has been elected president of the Electric Controller & Manufacturing Company of Cleveland, Ohio, succeeding A. C. Eastwood, retired. Mr. Pirtle held the office of vice-president and has been identified with the company practically since its organization in 1890.

Walter C. Allen, for many years electrical engineer of the District of Columbia, with headquarters at Washington, D. C., has been appointed executive secretary of the Public Utilities Commission of the District of Columbia, succeeding Major J. L. Schley, who was recently detailed to the U. S. Engineer Office at New Orleans, La.

William S. Kline of Chicago, the president-elect of the Commonwealth Edison Company Section of the National Electric Light Association, received his early education at Canton, Ill. Later he spent four years at Lake Forest University and was graduated with the class of 1895. Upon leaving school he became assistant secretary of the Western Passenger Association, which position he held for six years. During the last fourteen years Mr. Kline has been continually in the employ of the Commonwealth Edison Company, first as assistant to the secretary and treasurer, and later as the company's assistant secretary.

W. S. KLINE

Men of the Industry

Changes in Personnel and Position—Biographical Notes

James G. Wray has resigned as chief engineer of the central group of Bell Telephone companies to become associated with the firm of Hagenah & Erickson, public utility engineers, Chicago, specializing in appraisals, cost analyses and rate investigations.

Vernon Mann, who has been connected with the Texas Light & Power Company for several years in various capacities, has been appointed district manager in charge of the operation of the company at Taylor, Thorndale, Rockdale, Thrall, Granger, Bartlett and Hiland. Mr. Mann will maintain headquarters at **Taylor.**

J. E. Fries has resigned as assistant chief engineer of the Crocker-Wheeler Company, Ampere, N. J., and has joined the staff of the Tennessee Coal, Iron & Railroad Company as chief electrical engineer. Mr. Fries was born and educated in Sweden and graduated as an electrical and mechanical engineer in 1898 in Stockholm. Since coming to America in 1903 he has been connected with the Westinghouse Church Kerr & Company, the Allis-Chalmers Company and the Canadian General Electric Company. In February, 1908, he joined the Crocker-Wheeler Company, and has since held the positions of industrial engineer, Pacific Coast engineer, and, since November, 1914, that of assistant chief engineer. Mr. Fries has contributed numerous articles to the electrical press and has translated several scientific books from the Swedish and German languages.

Thomas A. Edison had the degree of doctor of laws appropriately conferred upon him by the telephone, to the development of which he has contributed several fundamental inventions, during the convocation of the University of the State of New York on Oct. 19. President Dr. J. H. Finley, speaking before the audience at Albany, N. Y., addressed by telephone Mr. Edison in his laboratory at Orange in these words: "On behalf of the university representing this State I have the honor to notify you that the regents have unanimously voted to bestow upon you its highest degree, a degree conferred by universities since medieval times a degree which the greatest universities of to-day have desired to bestow upon you, a degree of this university which was conferred upon Joseph Henry, but is held by only one living man, a degree which, for the first time in the history of universities, is conferred by means of that instrument whose world-wide use you have yourself made possible, the degree of doctor of laws, conferred upon you, not in *absentia,* but merely in *loco remote.*"

Thomas H. Day, electrical inspector of the New England Insurance Exchange, Hartford, Conn., had the fortieth anniversary of his entrance into the electrical field fittingly celebrated on Oct. 10 during the meeting of the western New England section of the National Association of Electrical Inspectors at Hartford. President G. E. Beardsley of the Hartford board of fire underwriters paid an eloquent tribute to Mr. Day and his connection with the electrical field, dating back to 1876, when he installed thermostat alarms in the coal bunkers of the old navy vessel Tennessee.

Obituary

Harry H. Gribben, superintendent of the Oakland (Cal.) factory of the Standard Underground Cable Company, died suddenly on Sept. 25 at the age of fifty-six. He had been in the employ of the Standard company for over thirty years.

William Ward Hincher, Chicago manager for Albert & J. M. Anderson Manufacturing Company, and Mrs. Hincher were killed on Oct. 18, when the automobile in which they were traveling to the Jovian convention at Indianapolis capsized near Shelby, Ind. A broken steering gear was believed to be responsible for the accident.

C. Alfred Littlefield, general agent for the New York Edison Company and former general secretary of the Commercial Section, N. E. L. A., and of the Illuminating Engineering Society, died of Bright's disease on Oct. 23 at the age of forty-eight years. Mr. Littlefield had been in central-station work in New York City since 1891. He was a charter member of the Illuminating Engineering Society, and was active in its committee work, serving as general secretary in 1914 and 1915. For two years he was also the secretary of the Commercial Section, N. E. L. A., and last year acted as chairman of its publications committee. Mr. Littlefield had been ailing for several months, and had been absent from his office during this time in an effort to recover his health.

C. A. LITTLEFIELD

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Drive and Twist Anchors

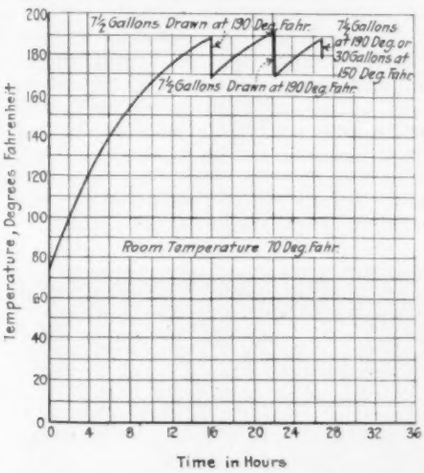
An anchor made especially for swamps, peat bogs, river beds, etc., where it is impossible to dig holes owing to the water, is now made by the Gund Mfg. Company, La Crosse, Wis. It is 9 ft. long, with a shaft ⅞ in. thick and blades that have a span of 12 in. The anchor is equipped with a drop-forged eye which is one solid piece with the rod. At the other end it has a drop-forged spear-shaped point which acts as a pilot in going

ANCHOR FOR EXTREMELY WET PLACES

through roots, gravel, or any other solid substance in the ground. The anchors can be driven down below the water or wet ground and into the solid earth underneath, thereby providing a substantial hold.

Immersion-Type Water Heaters

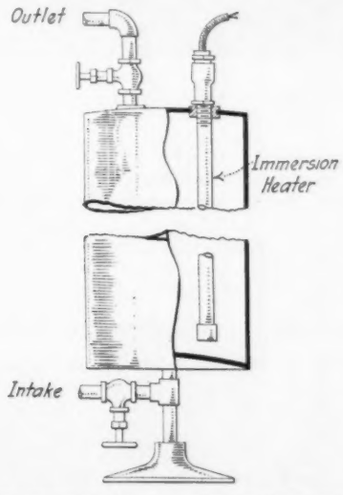
An immersion-type unity power-factor electric water heater, designed to fit an ordinary commercial 30-gal. or 40-gal. upright tank, is being made by the Lee Electric Radiator Company, 1266 Peoples Gas Building, Chicago, Ill. It consists of an iron pipe partly filled with oil in which the heating element is immersed. The pipe measures 54 in. by 0.75 in. inside diameter, and is equipped at the top with a standard thread so that it can be screwed into the standard opening always placed at the top of the tank. The lead-in wires are brought out through a fluid-tight electric coupling of special design. The chromel-wire heating element wound on a 0.5-in. special core occupies only about the bottom one-third of the pipe. Being surrounded by oil, however, and held away from the sides of the pipe by insulating spacers it is claimed that it creates, when hot,



PERFORMANCE CURVE OF 750-WATT HEATER

a circulation in the oil which heats the pipe along its entire length. Extending practically the entire length of the tank as it does, this heater forms an avenue of transit for the heated water so that it will quickly rise to the top of the tank where the outlet is located.

A feature of this heater is the heat insulating tank cover which is always



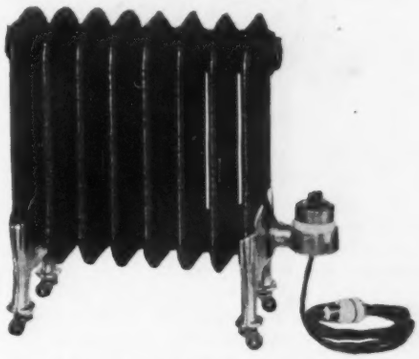
SIDE ELEVATION OF HOT WATER TANK, SHOWING LOCATION OF IMMERSION HEATER

furnished with it. This cover is made in layers of 0.5-in. hair felt, 1/16-in. asbestos and one thickness of canvas, and can be wrapped around the tank and laced. Tests have shown its specific heat loss to be 0.3 B.t.u. per square foot of surface per hour per degree Fahrenheit, difference of temperature. This loss is 0.2 B.t.u. per square foot of surface per hour per degree Fahrenheit difference in temperature less than that recommended as suitable by the range committee of the National Electric Light Association.

These heaters are made in 500-watt, 750-watt, 1000-watt, 1500-watt and 2000-watt sizes, although the three latter types are not listed and are considered special equipments. The performance curve of a 750-watt heater inserted in a 30-gal. covered tank is given herewith.

Portable Electric Radiator

Improvements have recently been made in the unity power-factor, oil-filled, portable electric radiator manufactured by the Lee Electric Radiator



OIL-FILLED PORTABLE ELECTRIC RADIATOR

Company, 1266 Peoples Gas Building, Chicago, Ill. Instead of the pressed seams formerly employed on the sheet-metal radiator coils, joints made by an acetylene welding process are now used. The joints between the coils and fitting attached to them are also made by the same method. This process was adopted to insure oil-tight construction. The radiators are now given a 100-lb. cold hydrostatic test before they are allowed to be shipped.

Changes have also been made in the type of fittings used so that the heavy external cast-iron parts are now replaced by pressed steel. This change increases the sensibility of the radiator, giving quicker response to the application of energy, permits a 20 per cent reduction in the net weight and gives a higher temperature rise per watt of energy expended. The height of the coils has also been changed to 20 in. This reduction in height was made to secure a coil which would give the most efficient transfer of heat from the hot sur-

faces to the air passing up along the coils.

Slight corrugations added to the pressed-steel sections partially equalize the reduction in height, but it has been found economical to reduce the heating surface about 10 per cent without changing the wattage in order to give more rapid temperature rise. The general plainness of the sections has been retained for sanitary reasons. The design still contains the three-column feature, since it has been found to give most effective circulation of the fluid in which the coil is immersed. These radiators are being made in 500-watt, 750-watt and 1000-watt sizes.

Show Window Lighting Reflectors

"C Lamp Scoop" and "C Lamp Hood" are two trade names assigned by the National X-ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill., to two new styles of show-window lighting reflectors which are intended especially for 75-watt, type C lamps. These

FIG. 1—LAMP HOOD SUITABLE FOR SHALLOW SHOW WINDOWS

reflectors are illustrated in Figs. 1 and 2, and are similar in design to the reflectors which are now on the market and known as the "Scoop" and "Hood." They have a finer system of corrugations than was formerly employed in the latter designs. These fine corrugations, it is claimed, are necessary to properly break up and distribute the light from the brilliant concentrated filament of the lamp. The "C Lamp Scoop" is intended for windows of average proportions where the trim is comparatively high on the background. The "C Lamp Hood" produces a higher concentration of light in the window, and is therefore suitable for show windows which are shallow from glass to background and of average height.

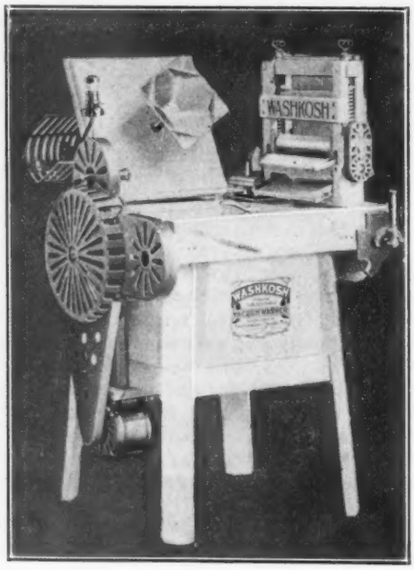
FIG. 2—LAMP SCOOP FOR WINDOWS OF AVERAGE PROPORTIONS

These reflectors are intended for windows having a maximum height of about 9 ft.

Motor-Driven Washing Machine

A motor-driven washing machine, known as the "Washkosh," is being offered the trade by the Banderob-Chase Company of Oshkosh, Wis. This is a vacuum-type machine, with no revolving parts, used in connection with a copperoid tub. The motion of a metal vacuum cup attached to the tub lid washes the clothes. In order to keep the socket cord connected to the motor off the wet laundry floor, the cord motor leads are securely fastened to the side of the machine with electrical connection made by means of a plug receptacle at the top of the washer.

The main features of the machine to which the manufacturer calls attention are as follows: It is gearless and practically noiseless; it is driven by a belt and a solid shaft, with the shaft in the center to insure even washing action; it cannot stop on center; all working parts are covered by guards; the cover when it is open rests on two supports;



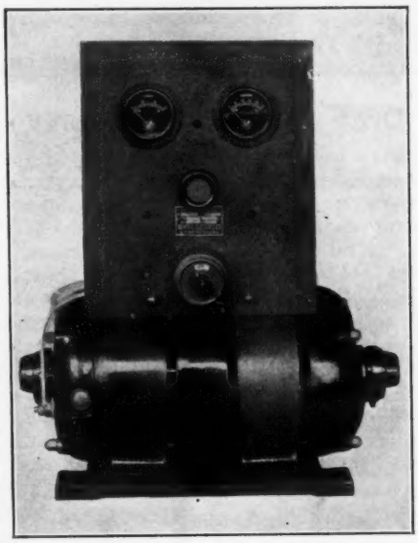
VACUUM-TYPE MOTOR-DRIVEN WASHING MACHINE

the complete machine, exclusive of its electrical equipment, has only nineteen distinct parts; the reversible wringer swings into three positions, and it can be stopped from either of two places.

Small Motor-Generator Sets

Battery-charging outfits, which are suitable for either garage or private use and for service on 60-cycle alternating-current and direct-current lighting circuits of either 110 or 220 volts, are being made by the Fort Wayne department of the General Electric Company. Two types of outfits are furnished in outputs of 50, 100, 175 and 250 watts and for charging voltages of 12, 18 or 24, direct current, sufficient generator field rheostat resistance being furnished to reduce the voltage for charging 6-volt batteries.

These outfits consist of a small motor-generator set on which is mounted a small controlling switchboard panel made of steel. The outfit for use on alternating current has an alternating current motor direct connected to a small direct-current generator, while the outfit for use on di-



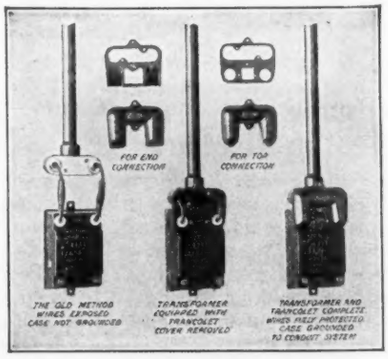
A BATTERY-CHARGING OUTFIT

rect-current lines has a small direct-current motor coupled to the direct-current generator. The switchboard has a voltmeter for reading the voltage generated, an ammeter for reading the charging current delivered to the battery, a rheostat as before mentioned for controlling the charging voltage, and a double snap switch at a single turn serves either to close or open both the motor and generator circuits.

The maximum space required by the largest of these outfits, the 250-watt size, is 18 in. in length, 10 in. in width and 21 in. in height.

Bell-Ringing Transformer Fittings

An appliance which eliminates exposed wires between a bell-ringing


FOR END CONNECTION
FOR TOP CONNECTION
THE OLD METHOD WIRES EXPOSED CASE NOT PROVIDED
TRANSFORMER EQUIPPED WITH TRANCOLET COVER REMOVED
TRANSFORMER AND TRANCOLET COMPLETE WIRES NEAT PROTECTED CASE GROUNDED TO CONDUIT SYSTEM

DETAILS OF LINK BETWEEN BELL-RINGING TRANSFORMER AND OUTLET FITTING

transformer and service outlet as manufactured by the Dongan Electric Manufacturing Company, 741-745 Franklin Street, Detroit, Mich., is illustrated here. The "Trancolet," as this device is called, consists of two parts, the base

which is designed to screw onto the transformer and the outlet fitting, and the cover cap. The base is apertured to correspond with the opening of a standard outlet fitting, and to receive the primary bushings of the transformer. When installing this device, the base is first placed on the transformer and fitting, then the joint is made with the service and the cap screwed in place. Besides protecting the wiring, this fitting permanently grounds the transformer case to the conduit system.

Vest-Pocket Flashlight

Recently there has been added to the Diamond group of flashlights, handled by the Import Sales Company, 318-324 East Thirty-second Street, New York City, a small vest-pocket size for which certain advantages are claimed. This flashlight, as illustrated here, has a clip which prevents the battery from short-circuiting and the lamp from being lighted in the pocket unknowingly. It

POCKET FLASHLIGHT WITH A PERMANENT CONTACT AND POCKET CLIP

is simple to reload, having two contacts inside the case enabling the battery to be inserted in the case in two ways; that is, with the side battery connection on either side of the case. Attention is called to the fact that the outside clip contact adds considerable value and efficiency to the popular size with nickel-plated case and has all the advantages of the fountain-pen flashlight, with the additional advantage that it is large enough to hold an efficient battery.

Improved Surface Heater Control

The Bryant Electric Company of Bridgeport, Conn., has recently put on the market an improved design of surface heater control switch particularly useful for installation in kitchens, pantries, laundries, etc., of the private residence or apartment. This device consists of a 10-amp. 250-volt indicating switch, a "Spartan" concealed receptacle, and in parallel with it an Edison receptacle for a pilot lamp. By means of a "Spartan" standard cap which fits into the receptacle, current can be supplied for an electric iron, washing machine, and other current-consuming de-

SURFACE HEATER CONTROL SWITCH ATTACHED TO STANDARD TWO-GANG BOX

vices. The standard caps for use with this outfit have two parallel blades for making connection with phosphor bronze spring contacts located in the slots well below the surface of the receptacle. Where polarized connection is desired, it is pointed out that the construction of the blades insures insertion of the cap in only the correct manner. While the switch itself is of the indicating type, unmistakable visual evidence of the use of current is provided by the pilot lamp. The device is approved for use on concealed, cleat or molding work. When used for concealed work, it can be attached by means of four screws furnished to any standard two-gang box as shown in the illustration. For cleat or molding work the wires are led into the base through the two holes provided in the end thereof. The cover is reversible so that in cleat and molding work the feed may come from either the ceiling or the floor.

A Porcelain Cleat-Base Receptacle

The Bryant Electric Company, Bridgeport, Conn., has recently placed on the market a porcelain cleat-base type of receptacle for knob and tube and other exterior wiring. It is pointed out that this device is particularly use-

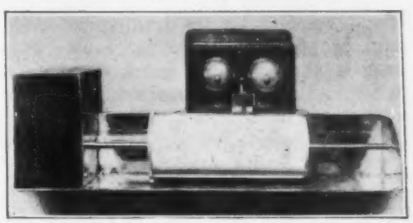
PORCELAIN CLEAT BASE WITH RECEPTACLE FOR EXTERIOR WORK

ful where the local wiring rules require covered connections. As will be noted from the illustration, the base is made in two parts, one of which can be fastened directly to the ceiling, and permits fastening of the wiring to the terminals before the top part of the device is attached. Furthermore, as will be noted, the device is so made that it is possible to use with it practically any one of the twenty-seven "New Wrinkle" bodies (sockets, switches or receptacles) made by this company.

A regular "New Wrinkle ring" or cap collar is permanently fastened in the opening of the base, which makes it possible to readily attach the bodies by means of novel spring clip fastenings in the corrugated ends of standard "New Wrinkle" shells. By means of this base it is claimed that it is possible to not only make a more convenient job — more readily installed — but a more finished job, and one that complies with requirements for this class of work. As will be appreciated, this device is also particularly applicable where exposed wiring is used for temporary or permanent decorative purposes.

Telephone Call Recorder

Charles E. Bedeaux, an efficiency engineer at Grand Rapids, Mich., has patented a device which will register all telephone calls on a local battery system made in the absence of a telephone subscriber. It consists of a steel shelf bolted to the battery box of the telephone, at one end of which a clock works operates a cogged rod which is



DEVICE TO REGISTER TELEPHONE CALLS

meshed with a large cog imposed at one end of a celluloid-covered cylinder. On this cylinder rests a pencil which is governed by a steel connection reaching through a bridge and embracing the clapper of the bell. With every ring the pencil is operated and marks of a code are inscribed on the cylinder, where they may be noted on the return of the owner. A clutch allows the device to be disconnected at will. In the code used No. 1 has one short ring; No. 2, one long; No. 3, one short, one long; No. 4, one long, one short; No. 5, two short; No. 6, two long; No. 7, two short, one long; No. 8, one long, two short; No. 9, one short and two long; No. 10, two long, one short.

As an example of the operation, suppose A calls C and receives no answer. A's number is 42683. He immediately calls back one long, one short, one long, two long, one long, two short, one short, one long. C interprets the number on his return and completes the connection.

Patents of Mr. Bedeaux provide for a ribbon attachment which will register the hour and minute of the call; also for the stationing of the instrument in a room remote from the telephone. It will then be operated through an electrical connection.

Electric Suction Cleaner and Carpet Sweeper

The latest model of the "Ohio" electric combined suction cleaner and carpet sweeper, manufactured by the Wise-Harrold Electric Company of Canton, Ohio, is shown in the accompanying illustration. This cleaner, it is said, will remove every description of litter by means of its revolving brush (belt-driven) installed in the nozzle and the large volume of air that is moved with great velocity by the high-speed motor and properly balanced fan. The dust-bag is arranged for quick detachment when it must be emptied. The machine can be adapted to any carpet or rug, it is pointed out, by the any-angle fastening device and rear adjustment. Each machine is equipped with a full complement of attachment tools, designed for every possible cleaning purpose.

LATEST MODEL OF THE "OHIO" ELECTRIC SUCTION CLEANER AND CARPET SWEEPER COMBINED

Fixture for Store Lighting

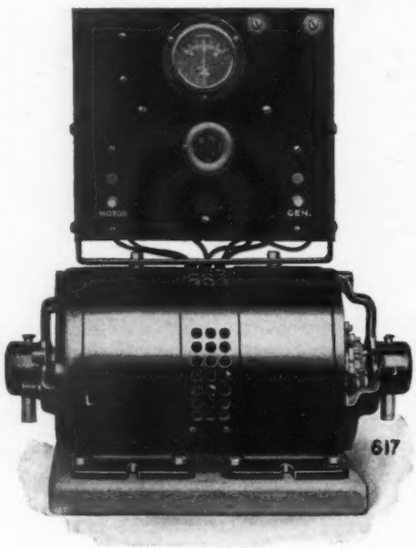
A lighting unit that provides a standard light of a given spectral composition for matching colors, and in most cases is better than daylight, inasmuch as it is always of a fixed value and does not vary continually both in color and intensity, is being manufactured by Moran & Hastings Manufacturing Company, 16 West Washington Street, Chicago, Ill. The "Ohmlite," as this unit is called, is constructed in such a way that the light from the lamp is reflected or diffused before it strikes the eye. The reflecting or diffusing means consist of a plurality of opaque or translucent standard strips arranged around or in front of the light source. These strips or planes are spaced apart and so arranged with relation to each other and the source of light, it is claimed, that the rays are properly reflected or diffused, no direct light passing between them. The different positions of the strips make it possible, it is said, to deflect the greater portion of the light downwardly, or upwardly or laterally, depending on the lighting effects desired.

LIGHTING UNIT SUITABLE FOR COLOR MATCHING

Battery-Charging Motor-Generator Set

A battery-charging outfit has been developed by the Robbins & Myers Company, Springfield, Ohio, which is made especially for charging automobile and motorboat batteries. The outfit is made in three sizes—80, 150 and 250 watts. The 80-watt size will generate current in voltages up to 8 volts, and the 150 and 250-watt sets, up to 15 or 30 volts, as desired. The motors of these sets are furnished to operate from 115 to 230-volt direct-current circuits or 110 and 220-volt alternating-current circuits of 25 to 60 cycles. These charging sets are regularly furnished with a steel switchboard, which is mounted in the frame at the top. This switchboard is provided with an ammeter in the generator circuit which shows the charging amperes, a rheostat in the generator field to regulate the rate of charge, a push-button switch in both the motor and generator circuits, a fuse block with fuses in the motor lines and terminals for connecting the motor to the line and the generator to the battery leads. When the outfits are furnished without the switchboard the 80-watt and 150-watt sets are provided with 10 ft. of duplex cord with detachable plug on the motor side and with 10 ft. of heavy duplex cable with universal lead-covered test clips in the generator side for connection to the battery.

Rheostats are not provided with the 80-watt sets which have no switchboards, since they are designed to give a tapering charge to the battery and a rheostat is not essential.

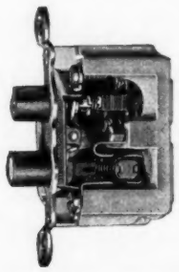


SMALL BATTERY CHARGING OUTFIT

Electrolier Push-Button Switch

An adjustable electrolier switch, with a standard push-button mechanism, to control two or three circuits, has just been placed on the market by the Arrow Electric Company of Hartford, Conn. This switch has the appearance and action of an ordinary single-pole push-button switch, in that pushing the pearl button connects the circuits and pushing the black button disconnects the circuits. The black button, however, has an additional function. It can be rotated whether the circuits are closed or open to four different positions, giving four combinations of lighting circuits. This button is so shaped at the end that it offers a gripping surface and also indicates by sight or touch the circuit on which the switch is set. The maker points out that it is not necessary to operate this switch through the various combinations to get to the "off" position, or to make two or three useless turns or pushes to get the desired circuit. Neither is it necessary for the lights in the room to be turned off even momentarily to get another circuit, or a different combination of lights. The black button by its rotating movement can be set at whatever circuit is desired and then the switch can be operated as a single-pole switch on that circuit.

In most electrolier combinations there is one circuit or set of lights which is generally used. The other circuits, or lights, are only used occasionally. With this switch the black button can be set on the circuit most generally used and the switch will then operate as an ordinary push-button switch on that circuit, entirely disregarding the other circuits. These, however, can be brought into service by simply rotating the black button.



ADJUSTABLE SWITCH THAT GIVES FOUR COMBINATIONS OF CIRCUITS

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

ROTARY-CONVERTER TRANSFORMER PROGRESS

Gain in Both Weight and Floor Space in the Latest Types Compared with Those Built Several Years Ago

According to the report of the committee on power generation presented at the recent convention of the American Electric Railway Engineering Association at Atlantic City, there has been a gain both in the weight and floor space required by the latest types of transformers now used with commutating pole rotaries as compared with those built several years ago. While this gain is not so great as in the case of rotary converters, it is nevertheless, appreciable, and results from the following causes: 1. The use of silicon iron permitting higher flux densities without increasing iron losses. 2. Better means for conducting away the heat from the transformer core and coils and 3. The reduction in the standard rating capacity in transformers applied to a given rated capacity in rotary converters.

COMPARISON OF ROTARY CONVERTER TRANSFORMERS OF 1915 AND 1913 (SINGLE-PHASE 11,000-VOLT CLASS, 15 PER CENT REACTANCE)

	1915 Type	1913 Type	1915 Type	1913 Type	1915 Type	1913 Type	1915 Type	1913 Type	1915 Type	1913 Type	1915 Type	1913 Type	1915 Type	1913 Type
Kilovolt-amperes	167	185	333	365	161	185	333	365	500	550	670	730	670	730
Class	OISC	OISC	OISC	OISC	OISC	OISC	OISC	OISC	OISC	OISC	OISC	OIWC	WOIC	OISC
Cycles	60	60	60	60	25	25	25	25	25	25	25	25	25	25
Weights, trans	1,370	1,550	2,515	2,700	2,650	3,000	4,200	4,400	5,930	5,700	8,340	7,050	5,900	9,000
Weights, case	1,840	2,150	2,820	3,700	2,160	2,450	3,730	4,250	4,220	6,050	6,180	9,050	2,250	2,800
Weights, oil	1,940	2,300	3,665	4,850	2,025	2,950	4,450	6,250	5,840	10,650	9,790	15,650	3,150	3,900
Weights, total	5,150	6,000	9,000	11,250	6,835	8,400	12,380	14,900	15,900	22,400	24,310	31,750	11,300	15,700
Floor space, square feet	11.9	11.9	12.8	16.7	10.5	12.8	16.7	21.8	21.8	28.4	28.4	49.0	12.8	15.7
Efficiency:														
One-half load	97.8	97.65	97.7	98.0	97.2	97.4	97.8	97.95	98.0	98.15	98.2	98.25	98.0	98.1
Three-quarters load	97.85	98.05	98.05	98.3	97.45	97.7	97.8	98.15	98.1	98.35	98.3	98.45	98.0	98.2
One load	97.65	98.15	98.15	98.4	97.35	97.65	97.85	98.15	98.0	98.30	98.2	98.45	97.8	98.2
One and one-half load	97.90	97.95	97.94	98.2	96.85	97.30	97.36	97.80	97.54	97.96	97.75	98.17	97.2	97.8
Price per kilowatt	$4.90	$4.95	$3.75	$3.85	$6.70	$6.65	$5.15	$5.25	$4.40	$4.45	$4.15	$4.35	*$3.30	*$3.30
Weight, per kilowatt	30.8	32.5	27.0	30.9	41.	45.5	37.1	40.9	32.	40.8	36.3	43.5	16.9	21.5
Square feet per kilowatt	0.071	0.064	0.0385	0.046	0.063	0.073	0.05	0.06	0.044	0.0515	0.042	0.067	0.019	0.0215

*Iron coils.
NOTE:—Temperature rise full load continuous, 40 deg. C., 1½ load, 2 hr., 60 deg. C. for all cases.

In explanation of the third cause, the committee calls attention to the fact that formerly it was customary to provide 10 per cent greater transformer capacity than converter capacity, with a view to taking care of the losses between the transformer and the converter. Since the load on railway rotary converters is usually a very fluctuating one, and since there is a much greater time element in reaching a given temperature in the case of a transformer than in the case of a rotary, it has been found to be unnecessary to provide any margin in the capacity of the transformer over that of the rotary. The accompanying table compares data for transformers now designed for commutating pole rotaries, designated as 1915 type, and those formerly used with non-commutating pole rotaries, designated as 1913 type.

The following conclusions are based on this table of comparisons: 1. The rated capacity of the 1915 transformer is approximately 10 per cent less than the 1913 transformer for use of the same rotary equipment. 2. The weight of the 1913 transformer is approximately 20 per cent less than the 1913 transformers of the same rating and frequency. 3. The floor space of the 1915 transformer is approximately three-fourths that of the corresponding 1913 transformers. 4. The efficiencies of the two types of transformers are approximately the same. 5. The price per kilowatt of the two types of transformers are approximately the same, but slightly in favor of the 1915 units.

MAGNET WIRE MANUFACTURERS AFFILIATE WITH A. M. E. S.

Join the Wire and Cable Section of the Association as a Magnet Wire Committee and Lay Plans for Permanent Organization

In accordance with the invitation issued by the general secretary of the Associated Manufacturers of Electrical Supplies, manufacturers of magnet wire held a meeting on Oct. 19, at the Hotel Biltmore, New York. The principal purpose of this meeting was to determine whether the magnet wire manufacturers would organize as an independent section of the Association, under the name of the Magnet Wire Section, or as a magnet wire committee of the present Wire and Cable Section of the Association.

B. S. Webb, of the New England Electrical Works, Boston, was elected chairman, and Edwin B. Bartram, of Alfred Moore, Philadelphia, secretary. Thomas M. Debevoise, counsel of the association, addressed the meeting, outlining the purpose of the association and the work to be accomplished, and making a number of valuable suggestions along legal lines relative to the work of the sections. Charles E. Dustin, general secretary of the association, explained in detail the aims and activities of the Associated Manufacturers of Electrical Supplies for the benefit of those present not already members, and of the many lines of activities already taken up in many of the sections, which have thus far given most gratifying results.

After a general discussion, on putting the vote to the meeting it was unanimously decided to organize as the Magnet Wire Committee of the Wire and Cable Section of the association. The meeting was then adjourned un-

til Friday, Nov. 24, at 10 a. m. at the office of the general secretary of the Associated Manufacturers of Electrical Supplies, 62 Cedar Street, New York. An invitation will be extended to all manufacturers of magnet wire, whether members of the association or not, to attend this next meeting, at which time the committee will be finally organized and different lines of activities decided upon.

Public Service Commission News

Pennsylvania Commission

The Public Service Commission has ordered the Lehigh Navigation Electric Company to discontinue rendering service for industrial operations at Nazareth, a territory occupied by the Pennsylvania Power Company, as the findings show that the Lehigh company crossed the power lines of the Pennsylvania company without permission.

Illinois Commission

Because unpaid and worthless bills receivable of a public utility obviously must be allowed as an operating expense in a rate-making procedure, and because equity to both the utility and the consumer demands the recognition of a reasonable cash deposit as security for the prompt payment of consumers' bills, the State Public Utilities Commission in two instances, has authorized and required the adoption of certain rules and regulations dealing with this subject.

The rules and regulations for the payment of bills (except prepayment meter accounts) which the commission authorized the Murphysboro Water Works & Electric & Gas Light Company to comply with, follow in part:

"1. Every present consumer, (individual, firm or corporation), who is not an owner of real estate and who, upon any discount date, has not paid the bills of the previous two months, shall be required either to furnish a cash deposit or to obtain a property-owner's guarantee, as security for present and future unpaid bills. Payment of the bills in arrears shall not exempt the consumer from furnishing the required security. The amount of the cash deposit shall equal two times the gross price of the average monthly quantity of gas, electricity or water (one or all) used by the consumer during the preceding twelve months. In event the consumer has not been connected to the company's mains for a period of twelve months, then the amount of the deposit shall equal two times the gross price of the average monthly quantity of gas, electricity or water (one or all) used by the consumer during the period of the service. The amount of the deposit shall be readjusted once in every twelve months. A property-owner's guarantee shall consist of a written agreement wherein some responsible property owner, who is acceptable to the company, secures the company from any and all losses, which may occur in case said consumer should fail to pay the service bills.

"2. Every new consumer (individual, firm or corporation), who is not an owner of real estate, shall be required, at the time of application for service, either to furnish a cash deposit in the amount of $5, or to obtain a property owner's guarantee, as security for possible future unpaid bills. After the applicant shall have been a consumer for three months' time, the amount of the deposit shall be adjusted to equal the gross price of the gas, electricity, or water (one or all) consumed during the first two full months during which meter readings have been obtained. At the end of twelve months, the deposit shall be readjusted to conform with Rule 1 hereinabove. In any adjustment of the amount of the deposit, either, the company shall refund the difference whenever the new deposit is less than the current deposit. The property shall make additional payment whenever the new deposit is greater than the current deposit. The property-owner's guarantee shall be the same as defined under Rule 1 hereinabove.

"3. The company shall acknowledge to the consumer the receipt of all deposits, using for this purpose a standard printed form to be known as the certificate of deposit. The company shall pay to the consumer interest at the rate of 5 per cent per annum upon the total amount of the deposit. Interest shall be due upon the first day of January of each year and shall either be paid in cash by the company shortly thereafter or be credited on the consumer's bill which is rendered not later than thirty-one days subsequent to the day upon which the interest falls due. The company, moreover, shall pay to the consumer any interest which may accrue upon the deposit between the interest date (Jan. 1) and the date upon which a deposit may be withdrawn at a termination of service. The amount of the deposit, plus all accrued interest and less all indebtedness to the company, shall be returned to the consumer upon presentation of the certificate of deposit, whenever service is no longer rendered at the premises of the consumer. Mere change of residence or of location of service shall not be deemed sufficient grounds either for requiring additional deposit or for requesting a refund of a portion of a deposit. If, upon a termination of service to a consumer there exist unpaid bills, and if the consumer has not advised the company definitely as to the disposition of the deposit, the company, in thirty days after the cessation of service shall apply the amount of the deposit (or any portion of said amount) to the liquidation of the consumer's indebtedness. The company, furthermore, shall endeavor earnestly to communicate with the consumer and to give notification of any unexpended credit due on the consumer's deposit.

"4. The company shall disconnect the service at the premises of a consumer whenever:

"(a) A present consumer fails to comply with Rule 1 hereinabove.

"(b) A new consumer fails to comply with Rule 2 hereinabove.

"(c) A consumer fails to pay a bill within forty-five days after expiration of the discount period of said bill, provided no proper exception has been taken to the bill. Should a consumer's bill remain unpaid fifteen days after expiration of the discount period of such bill, it shall be optional with the company to discontinue service at any time after said fifteen days and prior to forty-five days after expiration of the discount period.

"In no case shall the company disconnect any service for non-payment of account, unless a notice, warning the consumer of the intention to disconnect the service because of non-payment of account, be mailed to the consumer at least five days in advance of such service disconnection. Failure to receive a customary monthly bill from the company shall not entitle the consumer to exemption under these rules, unless such failure is due to carelessness on the part of the company. If requested by a consumer, the discount period for one month per calendar year will be extended twenty days, and during this twenty days the consumer will be entitled to the regular discount on the bill if the account is paid prior to the time limit of the extension. The discount period for churches, hospitals, charitable institutions, schools, and other public organizations or institutions shall expire thirty days after the last day of the month for which bill is rendered. No exception to any rule or regulation contained herein shall be made, except when the written consent of the State Public Utilities Commission of Illinois has been obtained."

Average Prices of Metals.—The average price for copper, zinc and lead during the last thirty years up to the beginning of 1916, according to Charles S. Trench, president, *American Metal Market*, was 14.06 cents per pound for copper, 5.36 cents per pound for zinc and 4.25 cents per pound for lead.

Buffalo to Vote on Municipal Plant.—Voters of Buffalo, N. Y., will be given an opportunity at the November election to express approval or disapproval of a plan to have the municipality own and operate an electric lighting plant and conduit system to generate, purchase, sell and distribute electricity to consumers and lease conduits in order to produce revenue for the city.

Electrical Accidents in Chicago Decrease.—There were seventeen fatal accidents from electrical causes in Chicago during 1915, a decrease of about 50 per cent in the number occurring during the previous year. Two of these accidents were caused by contact with 110-volt, and one with 230-volt alternating-current circuits, and two by contact with 550-volt street railway circuits.

Hydroelectric Commission Threatens to Cut Off Power When Rates Are Cut.—The Ontario Hydro-Electric Commission has threatened to cut off its supply of power to the city of Niagara Falls, Ont., if the City Council insists upon selling electrical energy at $10 per horsepower to a new industry which recently decided to locate in the city. The commission contends the minimum rate must be $14.

Money Voted for Survey Preliminary to Establishing a Municipal Plant in St. Louis, Mo.—A bill authorizing the expenditure of $12,500 for a preliminary survey to determine the advisability of establishing a municipal electric plant has been passed by the St. Louis board of aldermen. The bill provides that the survey is to be made by a special corps of engineers and experts working under the direction of the Department of Public Utilities. Much opposition was developed against the bill which was adopted by a majority of four. It is expected that several months' time will be required to obtain the data on which to base the size, cost and location of a municipal plant.

Additional Reasons for Revaluation in Cincinnati Case.—City Solicitor Charles A. Groom of Cincinnati has sent to the State Public Utilities Commission additional reasons for rejection of the valuation recently placed on the property of the Union Gas & Electric Company used for electrical purposes. This brings the total of his assigned reasons for rejection of the valuation and ordering a new hearing to fifty-one. The principal point in all the additional complaints is that the commission did not segregate the properties within and without the city of Cincinnati, but proceeded to take the total value for all properties used and useful within and without the city. This same question was raised during the hearing, when it was decided that it would be virtually impossible to segregate the figures. No date has been set for the hearing.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Types of Engineering Service.—Of the most widely-known forms of engineering service there are, it is stated in *Development*, published by Day & Zimmerman, three general types on the market: "(1) Engineering work 'free of charge' in conjunction with construction contracts. (2) Engineering work covering designs, construction details and supervision of construction. (3) Engineering work covering preliminary analyses and reports to determine scope and character of work, designs, construction details and supervision of construction."

Registration of Electricians in Chicago.—On Dec. 31, 1915, there were 1187 electricians registered in the department of gas and electricity of Chicago, an increase of 196 over the preceding year. The registration of electricians is giving excellent satisfaction, as the supervision which this registration affords the department insures a much more rigid compliance with the rules than was heretofore maintained. The enforcement of the ordinance requiring such registration, it is maintained, has protected the public against inferior work by irresponsible contractors.

Taxation of Hydroelectric Companies in Pennsylvania.—Replying to a question raised by the auditor general as to whether hydroelectric companies are liable for the tax on gross receipts, the deputy attorney general of the State of Pennsylvania recently gave it as his opinion that "if such water or water-power companies engage in electric lighting they may be taxable, but, on the other hand, I am of the opinion and constrained to advise you that if water and water-power companies do not in fact engage in the business of electric lighting they are not taxable on their gross receipts."

Junior Electrical Engineer.—On Dec. 2 the civil service commission of New York will hold a competitive examination for the position of junior electrical engineer for the Public Service Commission for the First District. The position pays from $901 to $1,200 per annum. The duties are to inspect the power houses and equipment of subway, elevated and street railways, lighting and power companies in New York City. Candidates must have had at least three years' training in a technical school of recognized standing and not less than one year's experience in electric railroad or electric lighting work or in the manufacturing or installation of electrical or mechanical apparatus. The examination is open to non-residents.

Cleveland Light Commissioner Will Delay Report.—W. E. Davis, city light commissioner at Cleveland, stated that his report of the operation of the municipal light plant will be delayed many months because of the necessity of giving a careful examination to the report of the accountants, Nau, Rusk & Swearingen, before he will be in possession of facts upon which to base it. He has the data based upon the figures from the new plant alone, but he cannot tell what others will be brought into the report of the accountants, with which he will have to contend in making his own report. He declares that plenty of time will be spent in an examination of this report.

Convention in Commemoration of Services of Joseph Henry.—At the annual convocation of the University of the State of New York held at Albany on Oct. 19, the general theme of which was "American Speech," a telephone demonstration was had with the speakers talking from different parts of the state. The occasion was made commemorative of the service of Joseph Henry, whose discovery while a teacher in Albany of the principle of electrical transmission was the beginning of the development which has made speech possible over great distances. The audience was invited to inspect the model of the statue to Henry which is to be erected near the site of the school where his experiments were made.

Considering New Service Rates at Toledo, Ohio.—At a meeting of the lighting committee of the city council at Toledo, Ohio, on Oct. 13 it was practically decided to employ an expert to aid in deciding on a new domestic rate. Professor Leiserson of Toledo University advised that it would be unfair to consumer and company alike to attempt to fix a rate without information upon which to base it. He said that the university trustees would be willing to employ a man and then retain him for university work afterward. Professor Leiserson had secured data regarding comparative rates from various cities, also a letter from the management of the Cleveland municipal plant giving information in regard to the rates charged there.

Brush Company's Scheme Aids Firemen.—A successful method of fire fighting recently took place in Galveston, Tex. A fire had partially consumed a warehouse and was rapidly spreading to other buildings and the laying of hose and other fire equipment was hampered through lack of sufficient light. The work of the firemen was facilitated by lights placed at the rear of the building occupied by the Brush Electric Company. Three 100-watt burners were suspended from wires of the company and lighted up the scene of the conflagration. One newspaper, commenting on the aid rendered by the Doherty Company, has this to say: "The action of the Brush Electric Company helped considerably in the work of quelling the fire, as it would have been very difficult to work in the dark."

New York Electrical Society.—The New York Electrical Society held the opening meeting of the season at the Electrical Show, Grand Central Palace, on Oct. 19. Thirty members were elected.

Cleveland Club Meeting. — Charles Whiting Williams, executive secretary of the Cleveland Federation for Charity and Philanthropy, addressed the Electrical League of Cleveland on Oct. 19, on the subject of "Some Social By-Products of Modern Light and Power."

Los Angeles Jovians Hear About Early Patent Decision.—George P. Barton, former general patent attorney for the Western Electric Company, spoke before the Los Angeles Jovian Electric League on Oct. 21, on the subject, "Some Early Electric Patent Decisions."

Schenectady Section of Institute.—The 176th meeting of the Schenectady Section of the A. I. E. E. was held on Oct. 20. Frank Sprague gave an informal talk on a month's cruise with the Atlantic fleet during the winter maneuvers with a review of the part taken by the electrical engineer in the upbuilding of the fleet.

Dayton Jovians Elect Officers.—At the meeting of the Dayton branch of the Jovian Order, held on Oct. 17, the following officers were elected: President, Frank S. Hall; vice-president, Frank B. Steele; secretary and treasurer, O. E. Howland. The executive committee consists of the officers and the following additional members: E. G. Beichler, C. W. Hosier, O. H. Hutchings, T. F. Kelly, C. A. Kurz and W. S. McKee.

Worcester Polytechnic Institute Branch, American Institute of Electrical Engineers.—The first regular meeting was held on Oct. 20. The subject was "Summer Experiences," and the speakers were graduate students and members of the senior class, who told of their work with such firms as the Crocker-Wheeler Company, the New England Telephone & Telegraph Company, and the Westinghouse Electric & Manufacturing Company.

New York Jovians to Hold Meetings Monthly.—The officers of the Jovian League of New York City have concluded that it is advisable to hold the luncheon once a month instead of every week. They expect that this change will concentrate the interest of the members and increase the attendance. There was therefore no luncheon last Wednesday, Oct. 25. The first monthly luncheon will be held Nov. 1, and thereafter on the first Wednesday of each month.

Philadelphia Iron and Steel Engineers to Discuss Automatic Control.—The November meeting of the Philadelphia section of the Association of Iron and Steel Electrical Engineers will be held on Nov. 4, at the Majestic Hotel. The speaker of the evening will be H. F. Stratton, general manager and chief engineer of the Electric Controller and Manufacturing Company, Cleveland, Ohio, who will speak on automatic control, the topic being "The Operation of Two or More Mechanically Connected Direct Current Motors, Permanently in Series or Permanently in Parallel."

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Harrisburg Jovians Elect Officers.—The new officers of the Harrisburg, Pa., Jovian League are: President, John S. Musser, president Dauphin Electrical Supplies Company; vice-president, George L. Bricker, Harrisburg Electric Supply Company; secretary-treasurer, Carey Williams, Bell Telephone Company. L. L. Ferree, construction superintendent of the Harrisburg Light & Power Company, has been chosen first tribune of the league. The elections were held at the fall rejuvenation. A large number of candidates were admitted.

Station Operating Committee, Ohio Electric Light Association.—At the meeting in Columbus on Sept. 26 it was decided to hold three open meetings, one at Toledo on Nov. 14 and one at Youngstown and one at Cincinnati, the dates for the two later meetings to be decided upon in the future. The morning session of each meeting is to be devoted to papers and discussions, followed by a luncheon with an informal talk, and in the afternoon points of interest will be visited. Among the subjects which will be considered at the Toledo meeting are: "The Work of an Efficiency Department as It Affects Station Operation" and "How Coal Should Be Bought and by Whom." A visit will be made in the afternoon to the power plant of the Ford Glass Works.

Winter's Program of Lynn Section of Institute.—The 1916-1917 program of Lynn Section, American Institute of Engineers, follows: Oct. 25—"The Human Side of Engineering," by Farley Osgood, assistant general manager of the Public Service Electrical Company of New Jersey. Nov. 8—"A Trip to the Argentine Republic," by Col. J. A. Shipton, Army War College, Washington. Nov. 22—"Education for a Career in Electrical Engineering," by Prof. W. I. Slichter, professor of electrical engineering, Columbia University. Dec. 6—"The Great War and Its Mechanical Equipment," by Frank W. Skinner, consulting engineer, New York. Dec. 20—"Manufacture of Steel from Ore to Finished Product," by F. N. Speller, metallurgical engineer, National Tube Company. Jan. 3—Subject to be announced later, by Prof. Elihu Thomson. Jan. 17—"By-Products of Coal," by H. A. Carpenter, consulting engineer, Pittsburgh. Feb. 3—Banquet. Feb. 14—Subject to be announced later, by Prof. D. S. Jacobus, president of the American Society of Mechanical Engineers. Feb. 28—"The Electrification of the Chicago, Milwaukee & St. Paul Railroad," by A. H. Armstrong, engineer General Electric Company, Schenectady. March 14—Subject to be announced later, by W. C. Fish, manager Lynn works, General Electric Company. In addition to the regular meetings, there will be evenings devoted to special subjects. Among the lectures are: November—"The Plattsburg Experience," by all who attended. December—"Cost and Accounting," by D. C. Lash and E. F. Fielder. January—"Pattern Making and Foundry Work," by J. Pemberton. Other lectures will be announced later as plans are made.

Programs of Meetings Arranged for Winter Season of Philadelphia Section of Institute.—Arrangements have been made for carrying out the following programs of meetings and papers during the 1916-1917 season by the Philadelphia section of the A. I. E. E. Nov. 13—regular meeting; Engineers' Club; "Manufacture and Testing of High-Voltage Porcelains," by A. O. Austin, chief engineer, Ohio Insulator Company; illustrated by high-voltage experiments. Nov. 23—joint meeting with Franklin Institute; Hall of Franklin Institute; "The Electric Strength of Air and Methods of Measuring High Voltage," by John B. Whitehead, professor of electrical engineering, Johns Hopkins University, Baltimore, Md. Dec. 11—regular meeting; Engineers' Club; "What Electricity Has Done for Philadelphia," by E. J. Cattell, city statistician, Philadelphia, Pa. Jan. 8—regular meeting; Engineers' Club; "Commercial Engineering," by C. J. Russell, Philadelphia Electric Company, Philadelphia, Pa. Feb. 8—joint meeting with Franklin Institute; Hall of Franklin Institute; "Modern Dynamo Electric Machinery, with Special Reference to Power and Traction Uses," by Alexander Gray, professor of Electrical Engineering, Cornell University, Ithaca, N. Y.; illustrated by lantern slides. Feb. 12—regular meeting; Engineers' Club; "Students' Night." The program will be arranged to be of particular interest to the large number of student members of the Institute in the Philadelphia district. March 8—joint meeting with Franklin Institute; Hall of Franklin Institute; "Dielectric Losses in Insulating Materials," by C. E. Skinner, engineer of research division, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. March 12—regular meeting; Engineers' Club; "Recent Research Work," by a member of the staff of the General Electric Company, research laboratory; details to be announced later. April 9—regular meeting; Engineers' Club; "Engineering Impressions of Japan," by St. John Chilton, electrical engineer, Philadelphia, Pa. May 14—regular meeting; Engineers' Club; subject and speaker to be announced later. June 11—annual dinner; details will be announced later. All regular meetings at the Engineers' Club will be preceded by an informal dinner at 6 p. m. at the club, and following the meetings social features and refreshments are arranged for.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

LICENSES FOR INDEPENDENT LAMP MANUFACTURERS

Output to Be Regulated, Permitting Growth with Market, but no Restrictions Placed on Price or Method of Marketing

Licenses to manufacture tungsten filament incandescent lamps under the Just and Hannaman patent are being issued by the General Electric Company, owners of the patent. All independent lamp manufacturers with the exception of the Independent Lamp & Wire Company, Inc., now in litigation with the General Electric Company on the Coolidge patent, will be offered licenses.

As a basis on which to issue a license, the final form of which was approved this week, the General Electric Company will ascertain the amount of the 1915 business of an applicant for a license and what percentage this business was of the General Electric Company's tungsten lamp business in 1915. This percentage will then be fixed as the percentage of the General Electric business which the licensee may do in any succeeding year. Thus, if a company's business was, say, 2 per cent of that of the General Electric in 1915, then in 1917, for instance, it could do a business equal to 2 per cent of the 1917 business of the General Electric Company. By means of reports at stated intervals, it will be possible to determine closely the allowable output of any licensee, with a leeway of perhaps 5 per cent. In this way the licensees will be able to grow proportionately with the market for lamps.

As a result of the decision in the Laco-Phillips case upholding the Just and Hannaman patent as fundamental, the General Electric Company was faced with the necessity of either closing up the independent lamp manufacturers and ruining their investment or of granting licenses. As a matter of good business, the General Electric Company preferred to recognize the existing investment by issuing licenses.

There are no restrictions in the license as to prices or as to the method of marketing lamps. Furthermore, the license excludes the use of the trade name "Mazda" by the licensees. Also, the licensees will not have any right to the use of "Mazda" service. That is, they will not have the use of the work of the research laboratories of the General Electric Company. The license, in other words, is merely an authorization by the General Electric Company to manufacture lamps under the Just and Hannaman patent.

ACTIVITY IN LINEMEN'S PROTECTIVE APPLIANCES

The Bulk of the Business Is Coming from the East and Middle West—Deliveries Being Quoted at Thirty Days

Construction and reconstruction activities in the central-station field have brought about an unusual demand for rubber goods to protect linemen working on live circuits. It is said, in fact, that business was never better. The greater bulk of the business is coming from the Eastern and Middle Western sections of the country.

Price conditions in the field are unusual. While the supply of raw materials is plentiful at present, prices have been advanced to those who distribute to the electrical trade. On the other hand, the trade itself has not been asked to pay increased prices. Whether this condition will continue to prevail for long it is impossible to say.

Deliveries of thirty days are being quoted at present, but there is no assurance that this condition will continue, since orders are still coming in at a record rate. Credits are good, and collections fair.

The export business is better than was to be expected under prevailing conditions. The outlook for the future, both in the domestic and foreign markets, is characterized as good.

TRADE STOCKS UP HEAVILY ON HEATING APPLIANCES

The Condition of Metal Market Which Prevents Still Greater Buying Actually Proves Beneficial to Manufacturers

As was expected dealers and central stations stocked up heavily in heating appliances before the latest raise in prices went into effect. When it was decided last fall to allow manufacturers to accept orders for delivery up to Oct. 15, 1916, at other than schedule prices it became evident that buyers would anticipate higher prices by ordering appliances to take care of requirements well into 1917. Many orders were placed that on the basis of past years would take care of the 1917 trade with the possible exception of the holiday demand.

Large as the stocking up has been, however, it is certain that under normal conditions in the metal market it would have been considerably larger. Many orders had to be refused owing to the inability of the factories to get the raw materials. Almost every part of the heating appliances was difficult to obtain. One prominent manufacturer ran low on screws a short time ago, and after spending a considerable sum of money on telephone calls to several screw manufacturers finally was able to buy $5 worth, no more. During the early summer a purchasing agent went personally many hundreds of miles to the works of a manufacturer of nickel-chronium wire to purchase about 5 lbs. of wire.

On the other hand, it is not difficult to see that the inability of manufacturers to procure large stocks of metal was beneficial to them. First, the trade was prevented from buying to the extent it wished to and so bringing to an abrupt halt the demand once the goods were delivered. Second, manufacturers have been enabled to maintain a higher load factor and a more uniform load or production curve than would be possible had raw materials been very plentiful. Third, it has been much easier for manufacturers to talk the higher schedule prices and to obtain them, with the demand as large as it is for heating appliances.

TUNGSTEN INCANDESCENT LAMP IMPORTS CEASE

Decision in Patent Case and Price of American Lamps Act to Restrain Importers from Placing Foreign Lamps on Domestic Market

In deciding the Just and Hannaman patent suit against the Laco-Phillips Company, importers of lamps made in Holland, in favor of the General Electric Company, Judge Mayer sounded the death knell of the imported tungsten filament lamp in the domestic market. The Laco-Phillips Company, which was probably the largest importer of lamps, has gone out of business so far as the United States is concerned. Other importers of tungsten lamps, if they do not wish to infringe the patent, must cease bringing such infringing lamps to this country.

Prior to the war there was a very appreciable trade in this country in foreign-made lamps, although they were mostly of the miniature type. The trade in standard incandescent lamps was practically confined to the products of domestic factories. Prices and quality of goods made this possible. Miniature lamps of domestic manufacture, however, played but a small part in the domestic market until late in 1914. It was purely a question of price. Foreign-made lamps sold for considerably less than the American-made product. In September, 1914, the price of American lamps was lowered to a price that could not be met by foreign manufacturers. Since then the American manufacturers of miniature lamps have had more than they could handle.

The decrease at that time, it is felt by some, was really not necessary in order to obtain a firm grip on this market. The war would keep German and Austrian lamps off the American market and these were the real competing lamps. However, with the cut in price in effect the door to this country was more firmly locked. Even if European manufacturers do send over lamps that do not infringe the General Electric's patents, it is claimed that they will not be able to compete on either a price or quality basis.

HEATING PADS ACTIVE

Market Will Undoubtedly Be Sold Out Long Before Winter Season Has Gone By

Last winter was an excellent season for electric heating pads. The idea took with the public and stock moved rapidly. This year it is felt that the demand by the public for these appliances will far surpass that of previous years. However, according to present indications, the supply will have found its way into the homes long before the winter is over. These pads have an asbestos lining, and asbestos manufacturers have been unable to supply all of the demands made on them. Heating pad manufacturers have been forced to satisfy themselves on this account with a smaller output than they would otherwise have had.

The year's output now has practically all been contracted for by jobbers, dealers and central stations. Once they are sold out they will have great difficulty in replenishing their shelves.

BUYING FOR FUTURE DELIVERY

To Secure Satisfaction Trade Would Do Well to Place Orders Twelve Months in Advance

Manufacturers are so swamped with orders, and materials are so scarce, that immediate deliveries on electrical goods are practically out of the question. Perhaps at this time the most striking example of this condition is to be found with holiday goods, such as flashlamps, Christmas tree lighting outfits, heating appliances, vacuum cleaners, washing machines and sewing machine motors. Ordinarily, orders placed with manufacturers during October could be filled for late November or early December deliveries. But this year, with the exception of a few isolated instances, orders for holiday goods that were placed after Oct. 1 were not taken, and, in fact, many orders that were placed in August and September stand but little chance of being delivered in time.

Buyers have been in the habit of holding off as long as possible before placing orders, and this year many persisted in their old habits in spite of repeated warnings. Department stores carrying a line of electrical goods, it is understood, have been the worst offenders in this respect, and it is more than likely that a number of these merchants will enter the holiday season this year with a wholly inadequate stock of electrical equipment.

After the impressive lesson of this year, manufacturers urge the trade to begin placing orders now for delivery for the 1917 holiday trade. Outside of the deficiency in the labor market, there is such a scarcity of raw materials that manufacturers must know many months in advance what their requirements will be, in order to make purchases at prices not exorbitant to those of the finished product, and also in order to insure a satisfactory stock of raw materials. Furthermore, manufacturers, in view of the prices of materials, will not overstock. Caution in buying is everywhere in evidence. No one cares to be caught in a receding market with huge stores of copper and iron and brass purchased at record high prices.

In the matter of motor-driven appliances, buyers must exercise still greater care and foresight. First, the appliance manufacturer must know his requirements in order to place orders for motors. The motor manufacturer in turn must know the demand in order to place his orders for copper and castings.

It is therefore evident that buyers of electrical equipment will receive the greatest satisfaction by placing orders for ten to twelve months' deliveries. It is certain that orders placed for three months' deliveries will receive scant attention. Furthermore, orders placed for three to six months' deliveries in many lines will be taken, subject to market conditions and no delivery date promised.

INEFFICIENCY OF LABOR

But 64.2 Per Cent as Much Work Received for the Same Expenditure of Money as Two Years Ago

Hand in hand with the present insufficiency of labor is inefficiency of labor. In spite of the fact that wages are around 25 per cent higher in the electrical manufacturing field than during the year prior to the war, about 20 per cent less work is obtained per individual. It is not difficult then by doing a little figuring to arrive at some very interesting facts. For the same amount of work 56.25 per cent more wages is paid; or for the same amount of money but 64.2 per cent as much work can be had to-day as two years ago.

Such an occurrence is merely the natural consequence of an extraordinary demand for labor at record wages. It is a well recognized labor axiom that for labor to be efficient it must be stable and not of the migratory or roving type. It takes a certain length of time to get accustomed to the practice of a particular shop. However, labor was never more roving than during the past year. Higher wages, bonuses, shorter hours and other such promises were used freely, yet honestly, to entice workmen from one shop to another.

In its train came the natural result of inexperienced and only partially trained labor accepting employment as skilled workmen. In fact, manufacturers were willing and frequently eager to pay skilled labor wages to any one who could make a real pretense at doing the work. Machinists were made almost over night from partially trained machinists' helpers. Lathe operators have been trained in a few days and put to work. In view of such conditions one of the most remarkable features of the situation is that labor is as efficient as it is.

Some manufacturers who years ago had the foresight to establish pension and bonus systems, have been more fortunate in keeping their shops full than their competitors with less foresight. Efficient, well-trained men, who had been in the employ of the company for a number of years, hesitated to sacrifice the future benefits of those years of service for a few more cents an hour on a job likely to terminate at a moment's notice. While the average labor efficiency of these shops has been higher than in less fortunate shops, there has been, nevertheless, a falling off in the general efficiency of the shop. Restlessness, the changing of a certain percentage of the force, desire for better wages and shorter hours have acted to reduce personal efficiency.

Further, with such unstable labor there has been an additional cost of about $3 per man hired for physical examination in those shops carrying employee insurance. This additional expense has been a very considerable amount in many instances. An example of what is happening in practically every industrial center of the United States is a New England factory that requires 250 men for full production. In the past ten months this company has employed 2250 men, and yet a few days ago had but 220 men at work.

Manufacturing and Industrial

Clarage Fan Company, Kalamazoo, Mich., announces the opening of a Chicago branch office at 123 West Madison Street, of which L. O. Monroe is in charge.

Ledoux & Delacroix, Montevideo, commercial agents for South America, wish to represent in Montevideo and Buenos Aires a manufacturer of electric cables.

The A. C. Mannweiler Company, Inc., 2719-2721 Broadway, Fort Wayne, Ind., announces that it is manufacturing a complete line of miniature incandescent lamps and automobile bulbs. The officers of this company, which was but recently incorporated, are: A. C. Mannweiler, president and treasurer; Ellsworth Hartman, vice-president, and Pauline W. Mannweiler, secretary.

Large Range Installation in Portland, Ore.—Through the activities of the Northwestern Electric Company, Pittock Block, fifty-four Hughes Western Electric ranges are being installed in the new apartment building under construction by F. R. Wassell at Fourteenth and Clay Streets, Portland. This is one of the largest orders for electric ranges yet placed in the city of Portland.

The Cleveland Battery & Electric Company, Cleveland, Ohio, manufacturers of "Hywatt" and "Hotspark" batteries, advise that an improvement has been made in their product through the perfecting of the process of manufacture and the elimination of impurities in the raw materials furnished them. The "Hywatt" batteries are rectangular in shape, and made in 3, 4½, 6, 7½, 9 and 12-volt sizes, for automobile use, stationary engine starting ignition, signal work and marine service.

The Alpha Electric Company, Inc., 116-118 West Twenty-ninth Street, New York City, has increased its capital stock from $25,000 to $50,000. The company reports it has more than doubled its business during the past year, and has prepared itself for a continuance of the progress it has made by securing additional floors in its present building and by the accumulation of stock on hand. The officers remain as formerly: Michael Coleman, president; George E. Coleman, vice-president and treasurer; Albert F. Thacher, secretary; James H. Hughes, general manager.

Second Window-Trimming Contest.—The National Lamp Works, for the second successive year, is conducting a show window-trimming contest among its distributors all over the country. Sixty prizes are offered, ranging from a Ford touring car down to $5 in cash. To every entrant in the contest a 32-page album entitled "How Sixty Window Experts Display National Mazdas" is being sent. This publication contains pictures of sixty of the best trims produced in last year's contest with reading matter emphasizing the features that lend selling value to each display.

New Western Headquarters of the Western Electric Company.—It has been announced that St. Louis will be the headquarters for the western district of the Western Electric Company. G. E. Cullinan, local manager, has been promoted to be district manager. The changes took effect on Oct. 16. The territory which will report to St. Louis will be southern Illinois, Kentucky, Tennessee, Mississippi, Texas, New Mexico, Colorado, Kansas, Utah, Oklahoma and Missouri and part of Idaho, Montana, Louisiana and Wyoming. In this district there are branch offices at Houston, Dallas, Denver, Salt Lake City, Oklahoma City and Kansas City.

F. Raniville Company, Grand Rapids, Mich., announces the opening of a New York Branch at 6 Church Street, New York City. The rapid development of the company's Eastern and export business, it is stated, makes this step necessary. A complete stock will be carried in New York. George S. Baker, formerly secretary-treasurer of Olmsted-Flint Company, will be in charge of the New York selling organization. The company states this step is pursuant to a policy of general expansion being pursued by F. Raniville, general manager of the company. The company was established in 1874, and has until recently confined its sales mostly to the Middle West.

Chicago Gets Rapid Delivery on Cast-Iron Posts. — The contract for supplying any number between 4000 to 7000 cast-iron street-lighting posts for the city of Chicago has been awarded to the George L. Mesker Company of Evansville, Ind. The posts, which are to weigh 225 lb. and stand 10 ft. 5 in. high to the light source, are of the type in common use on Chicago's residential streets. The city advertised for bids on Aug. 19, asking the bidders to quote prices on posts and globe fitters delivered at the rate of 650 a week. A summary of the bids presented is given in the table herewith. The prices in all cases are for posts delivered along the streets anywhere within the city limits. Deliveries on the contract will begin the third week in October.

SUMMARY OF BIDS ON CAST-IRON POSTS AND GLOBE FITTERS

Name of Bidder	Price per Post and Globe Fitter	Delivery in Posts per week
George L. Mesker Company	$13.23	650
King Foundry Company	13.50	650
Western Electric Company	13.85	50
Westinghouse Electric & Mfg. Company	13.85	50
Illinois Electric Company	13.85	50
Fort Dearborn Foundry Company	20.00	15
W. R. Garton Company	23.50	540

Hotpoint's New Guarantee and Exchange and Sample Order Propositions.—The Hotpoint Electric Heating Company has sent out the following announcement: "On and after Oct. 15, our guarantee on all of our appliances will be changed and a uniform guarantee will be adopted. The wording of this guarantee is as follows: 'Hotpoint toaster is guaranteed against mechanical and electrical defect for a period of one year from date of purchase by the user, providing it is used on circuits of voltage no higher than stamped on nameplate. We will replace defective parts under above guarantee free of charge, if returned to our nearest office, transportation paid. We pay return charges. Reduce transportation costs by returning defective part only, wherever possible. Examine cord before returning any part of this toaster, or better still, test the toaster with another cord. The conductor sometimes breaks near the connecting plug while the covering is still intact.' On all appliances which are shipped up to and including Oct. 14, will be furnished our present guarantee on yellow tag; after that date, the guarantee as noted above will be used on all our appliances and ranges, printed on manila tag. The guaratees on our appliances which are unexpired will be lived up to by us in the future, the same as in the past, and we want to assure you that our change in guarantee effective Oct. 15 will not in any way relieve us of any obligation which we have assumed under the guarantees we have attached to our appliances in the past. The exchange proposition, which in the past has applied to the acceptance of old Hotpoint appliances as part payment on latest models for which you allowed the customer a discount of one-third of list price and for which you were allowed a discount of 20 per cent in addition to your contract discount, will be withdrawn on Oct. 14, 1916. The sample order proposition under which we have been in the habit of sending Hotpoint appliances to the trade for a thirty-day trial period, with the privilege of return at the expiration of that time, will be withdrawn on Oct. 14. All goods shipped beginning Oct. 16 will be shipped on definite order only and will not be subject to free trial and return."

NEW YORK METAL MARKET PRICES

	Oct. 17 Selling Prices Bid	Oct. 17 Selling Prices Asked	Oct. 24 Selling Prices Bid	Oct. 24 Selling Prices Asked
Copper	£ s d		£ s d	
London, standard spot	123 10 0		124 0 0	
Prime Lake	28.25	to 28.50†	28.25	to 28.50†
Electrolytic	28.50	to 28.75†	28.50	to 28.75†
Casting	27.00	to 27.25†	27.12½	to 27.37½
Copper wire base	33.00†		33.00†	
Lead	7.00		7.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	15.00		15.00	
Spelter, spot	9.55	to 9.80†	10.17½	to 10.42½†
Tin, straits	40.85		.....	
Aluminum, 98 to 99 per cent	59.00	to 61.00†	59.00	to 61.00†

OLD METALS

Heavy copper and wire	23.00	to 23.50†	23.00	to 23.50†
Brass, heavy	13.50	to 13.75†	13.50	to 13.75†
Brass, light	10.25	to 10.75†	10.50	to 10.75†
Lead, heavy	5.87½	to 6.00†	5.87½	to 6.00†
Zinc, scrap	6.75	to 7.00†	6.00	to 6.50†

COPPER EXPORTS

Total tons to Oct. 24 21,681

†Nominal.

Corporate and Financial

Electric Bond & Share Company, New York, N. Y.—Directors of the company have declared an extra dividend of $1,000,000 on the common stock of the company, payable to holders of record at the close of business on Oct. 31. The directors have also authorized the issuance of $2,000,000 additional preferred stock and $2,000,000 additional common stock. The preferred stock is to be offered for subscription at par and accrued dividends to holders of preferred stock of record at the close of business on Oct. 31, in the proportion of one share of new stock for each three shares of preferred stock held. Payment is to be made on or before Nov. 29, plus accrued dividends at the rate of 6 per cent per annum from Nov. 1 to date of payment, or, at the option of the subscriber, in two equal instalments—one-half on or before Nov. 29 and one-half on or before Jan. 31. At the time of final payment, an adjustment will be made between interest at the rate of 5 per cent per annum on the first instalment and dividends at the rate of 6 per cent per annum on such preferred stock. The entire issue of $2,000,000 preferred stock has been underwritten by William P. Bonbright & Company, Inc. The $2,000,000 new common stock is to be offered for subscription at par and accrued dividends to holders of common stock of record at the close of business on Oct. 31 in the proportion of one share of new stock for each three shares of common stock held. All the now outstanding common stock is owned by the General Electric Company, which will also subscribe and pay for the additional issue of $2,000,000 common stock. With the issuance of this additional preferred and common stock, the Electric Bond & Share Company will have outstanding $8,000,000 of each issue. The company has paid dividends on its preferred stock at the rate of 6 per cent per annum since February, 1912, and prior to that time from the organization of the company, at the rate of 5 per cent per annum. Dividends at the rate of 8 per cent per annum have been paid on the common stock since July, 1909. An extra dividend of $1,500,000 was paid on the common stock in 1913. The company now has a surplus of $4,723,000, so that after the payment of the $1,000,000 extra dividend it will still have a surplus in excess of 45 per cent of the par value of the $6,000,000 preferred stock now outstanding, together with the $2,000,000 preferred stock now to be issued.

Milwaukee (Wis.) Electric Railway & Light Company.—A block of $500,000 of general and refunding mortgage 5 per cent gold bonds, due Dec. 1, 1951, is being offered at 94.5 and interest, yielding approximately 5.35 per cent.

Shawinigan Water & Power Company, Montreal, Canada.—An issue of $2,500,000 of two-year, 5 per cent secured gold coupon notes, closed issue, due Oct. 1, 1918, is being offered at 99.75 and interest, to yield 5⅛ per cent. The proceeds from the sale of this issue of notes are to be applied on account of payments for the construction for the government of the Province of Quebec of a large dam at the headwaters of the St. Maurice River, which, with other dams now in operation, will increase the company's capacity. The company will be reimbursed for these payments in 4.5 per cent bonds of the Province of Quebec. The proceeds are also to be applied toward financing additions and extensions to the properties of the subsidiary companies.

Utah Light & Power Corporation, Salt Lake City, Utah.—The company has filed at the corporation bureau of the Department of State, Maine, a certificate of increase of capital stock from $45,000,000, divided into 450,000 shares of the par value of $100 each, to $60,000,000, divided into 600,000 shares of the par value of $100 each. This makes the Utah Power & Light Company among the largest of the corporations organized under the laws of Maine. Two only are capitalized for a greater amount, the United States Smelting, Refining & Mining Company, capitalized at $75,000,000, and the Tennessee Railway, Light & Power Company, capitalized at $70,000,000. There are but two corporations besides the Utah Power & Light Company having a capitalization of $60,000,000, the Brazil Railway Company and the Commonwealth Power, Railway & Light Company.

New Utility and Industrial Companies

The U. B. Light, Heat & Power Company of Dayton, Ohio, has been incorporated with a capital stock of $10,000 by A. W. Drury, H. C. Cridland, W. R. Funk, R. C. Kumler and F. A. Z. Kumler.

The Shoals (Ind.) Light & Power Company has been incorporated by George A. Harrop, Benjamin C. Johnson, Lee D. Hincher, F. Gwin and Charles W. Slates. The company is capitalized at $10,000 and proposes to supply electricity for lamps, heaters and motors.

The Western Power Company of Canada of Montreal, Quebec, Canada, has been chartered with a capital stock of $50,000,000 to carry on a general electric light, heat and power business. The incorporators are: Charles M. Holt, Alexander Chase Casgrain and others.

The Orrtanna (Pa.) Electric Light & Power Company has been granted a charter with a capital stock of $5,000 to operate in Fairfield Township, Adams County. The incorporators are: Samuel H. Musselman of New Holland; Samuel Z. Musselman of Akron, and Ivan Z. Musselman of Orrtanna.

The Franklin Township Power & Light Company has been incorporated with a capital stock of $5,000 to operate in Franklin Township. The incorporators are: Samuel H. Musselman of New Holland; Samuel Z. Musselman of Akron, and Ivan Z. Musselman of Orrtanna. The office of the company is located at Orrtanna.

The Addison Electric Power Company of Rutland, Vt., has been incorporated by L. M. Frost, Edwin W. Lawrence and Leonard F. Wing, all of Rutland, Vt. The company is capitalized at $500,000 and proposes to erect a hydroelectric power plant on Leicester River to supply electricity to operate the Kingsley mill and other industries which it expects to control.

Trade Publications

Electric Sweepers.—The Wise-Harrold Electric Company of Canton, Ohio, has issued three illustrated leaflets describing its new electric sweepers.

Splicing Sleeves.—Hickey & Schneider, 61 Broadway, New York City, have just issued bulletin No. 40 covering H & S Seamless Copper Splicing Sleeves.

Glassware.—Bulletins No. 82 and No. 87 entitled "Thebian" and "Alba" respectively have recently been issued by the Macbeth-Evans Glass Company of Pittsburgh. These bulletins are carefully prepared and illustrate recent designs in glassware for decoration and efficiency.

Water Purification.—"Water Purification with Sulphate of Iron" is the title of a 152-page book prepared by the American Steel & Wire Company. The text deals with the early and present necessities of water purification, the methods used formerly and those at present. Illustrations of plants and results obtained by this company at these places are given. At the end of the book are given the chemical reactions occurring in water purification work, also a factor table of alkalinity equivalents, hardness equivalents and incompatible equivalents.

Industrial Research and Development.—Esterline & Angus, Indianapolis, Ind., have just published a little booklet outlining the record of their fifteen years of effort and experience in the application of scientific research, invention and design to the solution of problems encountered by some of the leading industrial companies of the United States. The organization confines itself particularly to that portion of engineering work of each of its clients which by reason of its nature does not come within the scope and experience of their regularly employed engineers. "The successful solution of most difficult problems," reads the preface to the booklet, "requires perspective and a consequent freedom from preconceived ideas, together with the experience, ability and the facilities for handling work of this character. Fifteen years' experience in this class of work proves that this method of procedure produces the desired results at far less cost, time and money; insures in the majority of cases the most satisfactory solution, and precludes the possibility of following unproductive channels."

New England

BIDDEFORD, ME.—The City Council has awarded the York County Power Company a contract for lighting the streets of the city for a period of five years, under the terms of which the company agrees to install an ornamental lighting system to consist of not less than 54 ornamental standards carrying four-lamp clusters. The city also has the right to substitute at any time during the contract tungsten lamps for arc lamps.

BOSTON, MASS.—James M. Curley, Mayor, has recommended to the City Council the adoption of the report of the Penal Institutions Commissioner asking for an appropriation of $41,500 for the construction of a power and heating plant at Deer Island.

LOWELL, MASS.—The City Council has voted to build a central lighting and heating plant for the new high school buildings.

SPRINGFIELD, MASS.—Plans are being prepared, it is reported, for the erection of a mill, 60 ft. by 300 ft., for the Bozart Rug Company. The construction of a power plant is also included in the plans.

WINCHENDON, MASS.—The Winchendon Electric Light & Power Company has petitioned the State Board of Gas and Electric Light Commissioners for permission to issue $258,000 in capital stock. The company, which was recently taken over by C. D. Parker & Company of Boston, has already made extensive improvements to its system and contemplates further extensions.

EAST PROVIDENCE, R. I.—The Connecticut River Power Company is securing the right-of-way for the extension of its service through the town over private property. The company, it is reported, will extend its lines from Providence to Fall River.

NEW BRITAIN, CONN.—The Public Utilities Commission has granted the joint petition of the Farmington River Power Company of Farmington and the Stanley Works of New Britain to extend the high-tension transmission lines of the Farmington company to New Britain, with some restrictions.

WINSTED, CONN.—The Winsted Gas Company, it is reported, contemplates the construction of a large electric power plant on the Coggins and Foskett properties. If a new power house is built the company, it is said, will extend its transmission lines to Torrington.

Middle Atlantic

AUBURN, N. Y.—The Public Service Commission has authorized the Empire Gas & Electric Company of Auburn to sell $61,000 in bonds at 90, the proceeds to be used for extensions to its generating and distributing systems.

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 7 for furnishing and installing refrigerating apparatus, electric cable and wire, copper, electric drills, sheathing felt, pipe fittings, lubricators copper pipe, spark plugs, tubing, valves, voltmeters, etc., at the navy yard, Brooklyn, N. Y. Proposal blanks may be obtained at the above office or from the supply officer, navy yard, Brooklyn.

BUFFALO, N. Y.—The Commercial Electrolytic Corporation, recently organized, has purchased a large tract of land in Buffalo and proposes to erect a fireproof factory building for the manufacture of a patented form of peroxide of hydrogen. The company has contracted with the Buffalo General Electric Company for about 1000 hp. of electrical energy.

EDEN, N. Y.—The Public Service Commission has approved the plans of the Niagara & Lake Erie Power Company of Fredonia to supply electricity in Eden. The transmission lines will be extended from either North Evans or Derby.

LANCASTER, N. Y.—The Public Service Commission has approved the franchises granted by the towns of East Hamburg and Clarence, Erie County, to the Depew & Lancaster Light, Power & Conduit Company of Lancaster for the construction of distribution systems and the exercise of franchises in these towns.

NEW YORK, N. Y.—Plans have been prepared by George H. Pegram, chief engineer of the Interborough Rapid Transit Company, for the construction of a new power house on 139th Street, a short distance east of Alexander Avenue, to cost about $40,000.

NEW YORK, N. Y.—Bids will be received by the Public Service Commission for the First District, 120 Broadway, New York, until Nov. 9 for the construction of signal towers for parts of the Seventh Avenue-Lexington Avenue, White Plains Road and Queensboro Subway Rapid Transit Railroads. Further information may be obtained at the office of the commission. Oscar S. Straus is chairman.

NIAGARA FALLS, N. Y.—The Carborundum Company of Niagara Falls will build an administration building on the property of the Niagara Falls Power Company, on the Niagara River front. It is proposed to tender the use of its present offices to the Massachusetts Institute of Technology, which has decided to establish a research laboratory at Niagara Falls.

NORTH TONAWANDA, N. Y.—The City Council has decided to invite competition for lighting the streets by electricity. The Tonawanda Power Company and the Niagara Light, Heat & Power Company will be asked to erect modern boulevard lamps in the business section of the city for experimental purposes. The Niagara company is trying to have the city adopt gas lamps. The present lighting contract expired Aug. 1.

PORT HENRY, N. Y.—The Public Service Commission has authorized the Port Henry Light, Heat & Power Company to issue $75,000 at par in capital stock and $414,000 in bonds at 85. Of the proceeds $86,500 will be used for a hydroelectric plant at Port Henry, $100,000 for purchase of land and water rights, $58,000 for a high-tension transmission line, $115,300 for construction of a generating station, and the balance for minor purposes.

SYRACUSE, N. Y.—Subject to the approval of the Board of Estimate and Apportionment the City Council has amended the special lighting ordinance so that the ornamental lighting district may be extended to include Montgomery Street, between Fayette and Jefferson.

CATASAUQUA, PA.—The Borough Council is considering the question of installing a municipal electric-light plant.

ERIE, PA.—Extensive changes are contemplated to the high-tension conduit system to make the subway adequate for the needs of the two electric companies. George E. A. Farley of Baltimore, Md., is consulting engineer.

HAUTO, PA.—The Lehigh Navigation Electric Company of Hauto has applied to the Public Service Commission for approval of its purchase of the franchises of the Little Lehigh Electric, Alsace Township Electric, Rockland Township Electric and Ruscomb Manor Township Electric Companies.

MILLERSBURG, PA.—The Millersburg Electric Light, Heat & Power Company is planning to build a new plant on the site of its present plant on which work has already begun. Contracts, it is understood, have been placed for machinery. The company has purchased the electric plants in Newport and Mifflin. Transmission lines will be erected across the Susquehanna River and extended to Newport, Mifflin, Millerstown, New Bloomfield, Port Royal, Thompsontown, Mexico and possibly to Duncannon and Liverpool; also to Halifax, where the company has a contract to light the borough.

PHILADELPHIA, PA.—Revised plans are being prepared for a power house and kitchen for the Misericordia Hospital, Fifty-fourth Street and Cedar Avenue. E. F. Durang & Son are architects.

PHILADELPHIA, PA.—The contract for electrical equipment for the 15-story apartment house located at Sixteenth and Spruce Streets, has been awarded to the United Electric Construction Company of Philadelphia. Frederick Webber is architect.

PHILADELPHIA, PA.—The electrical committee has recommended to the City Council the installation of 550 new electric street lamps, to be maintained by underground wires. Of these 175 are to be placed by the Department of Public Safety and the remainder will be erected in the different wards of the city.

PHILADELPHIA, PA.—Bids will be received by the Bureau of Charities, Philadelphia, until Nov. 6, for construction of five buildings, including electrical work, heating and ventilating, etc., for the Philadelphia Institution for Feeble-Minded at Byberry. Phillip H. Johnson, Land Title Building, Philadelphia, is architect.

PITTSBURGH, PA.—The Pittsburgh, Harmony & New Castle Railway Company is reported to be considering the purchase and electrification of the Pittsburgh, Lisbon & Western Railroad, running from New Galilee, Pa., to Lisbon, in addition to the plan of an extension from Darlington, through East Palestine and New Waterford to connect with the Youngstown & Southern Railway at Columbiana.

SHILLINGTON, PA.—The board of directors of the poor of Berks County are considering the installation of an electric-lighting plant at the Berks County Almshouse. The cost is estimated at $12,000.

LAKEWOOD, N. J.—The Board of Public Utility Commissioners has granted the Lakewood & Coast Electric Company permission to issue $19,500 in capital stock and $20,000 in bonds, the proceeds to be used for extensions and improvements.

MAYS LANDING, N. J.—Work will begin at once on extensive improvements to the cotton mills of the Water Power Company, including the erection of a three-story addition to the factory and the installation of steam turbine to generate electricity to operate the mill during low water periods.

MORRISTOWN, N. J.—In connection with the proposed electrification of its railroad from Morristown to Essex Fells, the Morristown & Erie Railroad Company will erect a substation in Morristown. Energy will be furnished by the Morris & Somerset Electric Company.

NEWARK, N. J.—Bids will be received by the Common Council until Nov. 3 for electrical work, lighting fixtures, etc., for the municipal building on Franklin Street. Frank Grad, American National Bank Building, Newark, is architect.

NEWARK, N. J.—Bids will be received by the Council until Nov. 3 for electrical installation, heating and ventilation, elevator, etc., in the proposed police headquarters on Franklin Street. Jordan Green, Essex Building, Newark, is architect.

PASSAIC, N. J.—Arrangements are being made by the Kent Motors Corporation to establish an automobile plant, between Belleville and Passaic, to cost about $500,000. A site of more than 16 acres has been purchased and work will soon begin on the erection of a factory, power house and assembly building.

WOODBURY, N. J.—The installation of a municipal electric-light plant is under consideration by the City Council.

FORK UNION, VA.—The Fork Union Military Academy is contemplating the installation of an electric-light plant.

RICHMOND, VA.—Improvements are contemplated to the municipal electric-light plant, to cost about $35,000. Bids are asked on a steam turbine. E. W. Trafford is superintendent.

WINCHESTER, VA.—In a decision handed down by the West Virginia Court of Appeals the Public Service Commission was upheld in granting the Northern Virginia Power Company of Winchester the privilege of raising its dam near Millville. The company proposes to raise its dam from 12 to 21 ft. so as to increase the output of the plant. An injunction was sought by D. J. Howell who owns a water power above the dam.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 20 for an automatic electric clock system in the building, Interior Department Offices, Washington, D. C. For details see proposal columns.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 4 for radio masts for the receiving station in the State, War and Navy Building, Washington, D. C. Plans and specifications may be obtained on application to the bureau. F. R. Harris is chief of bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Mare Island, Cal., Schedule 293—one automobile ambulance; Schedule 297—1000 5-cp. instrument lamp sockets, 2000 lb. copper pipe. Puget Sound, Wash., Schedule 297—six engine room clocks, 285 lb. 20-in. by 48-in. hard sheet rubber; Schedule 294—six 220-volt, alternating-current motors. Charleston, S. C., Schedule 316—two engine room and fire room clocks, one steam driven air compressor, two indicators for auxiliary engines, one steam whistle. F.o.b. works, Schedule 310—200,000 minor caliber tracer fuses. Washington, D. C., Schedule 311—8000 lb. lead wire, 10,000 lb. soft copper sheets, in strips, 4100 ft., galvanized iron pipe. Brooklyn, N. Y., Schedule 305—miscellaneous interior communication cable, 10,500 ft. telephone cable, 12½-in. portable electric drills, 12 double scale portable voltmeters, miscellaneous twin-conductor wire.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

Various, Schedule 289—9300 ½-in. to ⅞-in. spark plugs. Norfolk, Va., Schedule 303—miscellaneous brass sheet, 40,000 lb. manganese ingot bronze, miscellaneous copper bar, 150,000 lb. ingot copper, miscellaneous sheet copper. Applications for proposals should designate the schedule desired by number.

North Central

DETROIT, MICH.—The John A. Crowley Steel Company of Detroit is building a steel plant in Delray, a suburb of Detroit, which will be equipped with electric furnaces. The Gronwall-Dixon electrical smelting process will be used.

GRAND RAPIDS, MICH.—Steps have been taken by the East End Improvement Association to secure the installation of ornamental lamps in that section of the city.

GRAND RAPIDS, MICH.—F. W. Burgstahler & Son have been awarded the contract for construction of power house for the National Brass Company, to cost about $7,000.

PETOSKY, MICH.—The city of Petoskey contemplates the purchase of new waterwheels and possibly a new generating unit for the municipal electric-light plant. James E. Viles is city clerk.

ST. CLAIR, MICH.—The St. Clair Electric Light and Water Works is erecting one and one-tenth miles of primary line for 2300 volts. Material has been purchased. W. M. Barron is superintendent.

CINCINNATI, OHIO.—The city officials are considering the question of issuing bonds to provide funds for the installation of a permanent ornamental lighting system on the Hoppole Street viaduct. The cost is estimated at about $13,000. Temporary lamps have been installed.

CINCINNATI, OHIO.—Bids will be received at the office of the clerk of board of education, Denton Building, Seventh and Race Streets, Cincinnati, until Nov. 16 for construction of Industrial Arts Building, tunnel "K," and power house in one specification, and gymnasium, tunnel "J," and stadium in another specification of the new East Side High School, located at the corner of Madison Road and Erie Avenue, Hyde Park, Cincinnati. Plans and specifications may be obtained upon application to C. W. Handman, business manager, upon deposit of $25.

COLUMBUS, OHIO.—Bids will be received by Herbert M. Myers, secretary of the State board of public buildings, 333 Chamber of Commerce Building, Columbus, Ohio, until Nov. 9 for furnishing material and labor for lighting and decorating the Ohio State Capitol at Columbus, Ohio. Plans and specifications may be obtained upon application to Fred W. Elliott, architect, 515 Chamber of Commerce Building, Columbus.

COLUMBUS, OHIO.—The Ohio State Telephone Company has petitioned the Public Utilities Commission for permission to issue $2,000 000 in capital stock. It has also filed with the commission a statement of the expenditures to be made on proposed and uncompleted improvements, aggregating $3,446,447, as follows: Long-distance equipment in Ohio, $261,039; Cleveland, $703,615; Toledo, $587 952; Columbus, $348,465; Franklin County system, $42,697; Dayton, $190,846; Montgomery County lines, $6,312; Youngstown, $410 905; Canton, $157,912; Findlay, $13,480; Alliance, $27,544; Massillon, $69,801; Washington C. H., $34,816; Zanesville, $113,918; Akron, $216 276.

DAYTON, OHIO.—The Oakwood Street Railway Company has applied to the Public Utilities Commission for authority to issue $10,000 in bonds, the proceeds to be used for improvements.

MASSILLON, OHIO.—Bids will be received by William A. Pritzckee, director of public service, Massillon, until Oct. 31 for installation of equipment and furnishing energy for the new ornamental street-lighting system and general street-lighting system for a period of ten years.

RUSSELLVILLE, OHIO.—Bids will be received at the office of L. P. Hanselman, village clerk, Russellville, until Nov. 4 for furnishing material and installing an electric-lighting system in the village of Russellville, in accordance with plans and specifications now on file in the office of the village clerk.

TIFFIN, OHIO.—The steel tower high-tension transmission line to be erected by the Ohio Light & Power Company will supply electricity in Amsden, Kansas Station, Bettsville and Burgoon. A branch line will also be erected to Helena, Gibsonburg and Millersville.

LA GRANGE, KY.—Steps have been taken to organize a company to operate an electric-light and power plant and ice factory in La Grange. E. S. Tachau, J. B. Wilson of Louisville; D. H. French, Mayor J. B. Davis of La Grange, and others, are interested.

MURRAY, KY.—The proposal to issue bonds for a municipal electric-light plant will be submited to the voters at the November election.

FRANKFORT, IND.—The Ingram-Richardson Company of Frankfort has engaged Esterline & Angus, consulting engineers, Indianapolis, to prepare plans and supervise the installation of complete power equipment for its new plant now being erected for the manufacture of enameled metal ware.

FRANKFORT, IND.—The McDougall Kitchen Cabinet Company of Frankfort has engaged Esterline & Angus of Indianapolis, consulting engineers, to design and supervise the erection of an entire new manufacturing plant. This will include designing building, selection of equipment, heating, ventilating and power installation. The plant will be equipped with electric-motor driven machinery throughout.

BERWYN, ILL.—Bids will be received by the City Council until Nov. 7 for the installation of an ornamental street-lighting system and a general street-lighting system, to cost about $15,000. For details see proposals.

CHICAGO, ILL.—In a report to the Council committee on oil, gas and electric light has recommended that the city's fire-alarm and police signal system should be rebuilt.

BURLINGTON, WIS.—The Wisconsin Gas & Electric Company contemplates extending its transmission line to the south shore of Brown's Lake, where electricity will be supplied to private consumers and for operating ice harvesting machinery.

SHARON, WIS.—The Southern Wisconsin Power Company of Madison has taken over the municipal electric plant and will supply electricity in Sharon. Improvements will be made to the plant.

WILTON, WIS.—Plans are being prepared for the installation of additional hydroelectric equipment in the plant of the Wilton Light & Power Company.

BECKER, MINN.—The City Council has granted the Monticello (Minn.) Power Company a franchise to supply electricity in Becker and Clear Lake.

BROWNTON, MINN.—The village of Brownton is considering changing the municipal electric-light plant from a direct to alternating-current system, taking energy from a high transmission line. Nothing definite has been decided upon. W. G. Sturdevant is village recorder.

DODGE CENTER, MINN.—The property of the Iowa-Minnesota Light & Power Company of Dodge Center was taken over on June 1 by Mozingo and Mack, former proprietors of the Clarion electric plant, Clarion Iowa. A Murray engine is now being installed to replace a 65-hp. producer gas engine. The company also supplies electricity in Haywood, 9 miles distant. M. E. Mozingo is manager.

FARIBAULT, MINN.—The Northern States Power Company of Faribault has just completed the erection of a 12-mile 13,000-volt, three-phase transmission line to West Concord. Work has just been started on an 8-mile extension to the villages of Mantorville and Kasson. The village of St. Clair will be served by a 6-mile, 13,000-volt single-phase transmission line.

JEFFERS, MINN.—The city of Jeffers is planning to install an electric-lighting system. Energy to maintain the plant will be secured from the Lamberton plant.

MANKATO, MINN.—The Consumers Power Company is now erecting a transmission line from St. James to Butterfield, to be completed within 30 days. The company will erect distributing lines from Butterfield. An electric transmission line is also being built from St. Peter to Cleveland, and a distributing system in Cleveland. Energy is transmitted at 13,000 volts. R. E. Brown is manager.

MARSHALL, MINN.—A new boiler, 72 in. by 18 ft., is being installed in the municipal electric-light plant. A. L. Fields is superintendent.

ST. PAUL, MINN.—The City Council has approved plans providing for extension of the ornamental lighting system in several downtown streets.

ST. PAUL, MINN.—Plans are being considered by the Great Northern Railroad Company for equipping more than 300 miles of the main line between Spokane and Seattle, Wash., and other mountain divisions in the West for electrical operation. The Great Northern company, through a subsidiary company, controls water rights on the Chelan River in Washington, and the present plans, it is said, include the raising the level of Lake Chelan, near which the main power plant would be established. Preliminary work, it is understood, will begin next summer.

CEDAR RAPIDS, IOWA.—The capital stock of the Iowa Electric Company has been increased from $600,000 to $800,000.

CENTERVILLE, IOWA.—The Centerville Light & Traction Company expects to erect a 33,000-volt, three-phase, 60-cycle transmission line from Centerville to Allerton, a distance of 12 miles, after the first of the year.

IOWA FALLS, IOWA.—The city of Iowa Falls is contemplating the construction of reservoir, pumping station, to be equipped with electric motors or oil engines for power purposes.

ROCKINGHAM, IOWA.—The Town Council has granted the Peoples Light Company of Davenport a 25-year franchise to supply electricity and gas in Rockingham, subject to the approval of the voters.

ROLFE, IOWA.—Bids will be received until Nov. 9 by James Bruce, secretary of independent school district of Rolfe, for construction of school. Separate bids to be submitted for electrical work, heating and plumbing, etc. G. L. Lockhart, Endicott Building, St. Paul, Minn., is architect.

BRUNSWICK, MO.—The capital stock of the Brunswick Light & Water Company has been increased from $10,000 to $25,000.

INDEPENDENCE, MO.—Plans are being considered for the construction of a power plant, gymnasium and vocational building, to cost about $50,000, for the McCune Home for Boys of Jackson County, near Independence. White & Deane, 311 Bellefountaine Street, Kansas City, Mo., are architects.

KANSAS CITY, MO.—Bids will be received by Fred C. Gunn, architect, board of public works, Republic Building, Kansas City, until Nov. 10 for construction of addition to hospital (nurses' wing), to cost about $100,000. Separate bids to be submitted on heating, plumbing and electric wiring.

MOBERLY, MO.—The City Council is considering extensions to the street-lighting system.

TOWNER, N. D.—Preparations are being made by T. K. Strand, who was recently granted a franchise in Towner, to install an electric-lighting plant.

CLARK, S. D.—The City Council is considering a proposal submitted by outside capitalists to install an electric-lighting system here. If granted a 20-year franchise they agree to install a system, to cost about $30,000.

BAYARD, NEB.—The Intermountain Electric Light & Power Company of Lama, Col., has been granted a franchise to supply electricity in Bayard.

COZARD, NEB.—Bids will be received by the school board of Cozard District No. 11, Dawson County, Cozard, until Nov. 3 for construction of a high school building. Separate bids, to be submitted for electric wiring, heating and ventilating and plumbing. Plans and specifications are on file in the office of R. A. Bradley & Company, architects, Exchange National Bank Building, Hastings, Neb.

FORT CALHOUN, NEB.—The City Council has made arrangements with the Omaha Electric Light & Power Company to supply energy to operate the street-lighting system to be installed here. A transmission line will be erected from the Douglas County line to Fort Calhoun.

ALTOONA, KAN.—Plans are being considered for installation of an electric-light system and improvements to water-works system, to cost about $22,000. Riley & Hardman of Parsons are engineers.

GENESEO, KAN.—The installation of an electric distribution system in Geneseo is under consideration. Energy to operate the plant will probably be secured from the United Electric, Water & Gas Company of Hutchinson.

INDEPENDENCE, KAN.—The City Council is considering calling an election to submit to the voters the proposal to issue bonds for the installation of a municipal electric-light and power plant.

KANSAS CITY, KAN.—The Municipal Electric Light Department has taken over the entire street-lighting of the city. The Wellsbach Street Lighting Company, until recently had lighted the streets of the city with gas lamps. There are now 1417 gas lamps, which will be replaced with electric lamps, material for which has been ordered. Plans are being prepared for the erection of a new substation. The site has not yet been definitely decided upon. Negotiations are under way between the light department and the Cudahy Packing Company whereby the municipal plant will supply electricity to operate the entire plant of the

company. At present energy is furnished by the municipal plant to operate the ice plant. L. H. Chapman is superintendent of light department.

OTTAWA, KAN.—The installation of an ornamental lighting system on Second Street, from Hickory to Walnut, is under consideration. C. S. Pugh is city engineer.

VIOLA, KAN.—The City Council has granted the Sumner Light & Power Company a francnise to supply electricity here for a period of 20 years. A transmission line will be erected from Wellingnton to Viola.

Southern States

KERNERSVILLE, N. C.—The City Council has awarded a contract for the construction of an electric-lighting system and distributing station to cost about $9,000; also has contracted with the Southern Public Utilities of Charlotte to furnish energy, connecting with the company's lines at Waughtown.

NEWBERN, N. C.—The Newbern Coca-Cola Bottling Works of Newbern would like to receive prices on a 20 or 30-hp. boiler, electric elevator and a 10-hp., three-phase, 60-cycle electric motor.

ELBERTON, GA.—The City Council has granted the J. B. McCrary Company of Atlanta, Ga., which have been contemplating a hydroelectric power development on Broad River an extension of time (until 1918) in which to have its transmission lines extended to Elberton.

MANASOTA, FLA. — The Manasota Water, Light & Ice Company, recently incorporated with a capital stock of $10,000, proposes to build a water and light plant and ice factory in Manasota. The officers are: Charles G. Strohmeyer of Sarasota, vice-president, and S. Hamilton Bemis of Richmond, Va., secretary and treasurer.

ST. CLOUD, FLA.—Bids will be received by the city of St. Cloud, Fla., addressed to Fred B. Kenney, city clerk, for the construction of a municipal electric-light plant and equipment as follows: Two each, boilers, engines, generators, motors, pumps, water purifiers, feed-water heaters, switchboard, transformers, meters, hydrants, valves, fuel-oil plant, tower and storage reservoir, cast-iron pipe, spiral, riveted pipe, steam pipe and fittings, vitrified sewer pipe, crane and stack, steel stack, alternate brick or cement siphons, centrifugal pump, etc. Sanitary sewers and sewage disposal systems, street paving, approximately 11,000 yards. Special information on any of the above work can be obtained by addressing Wilbur A. Ginn, engineer in charge, St. Cloud. Bids will be received until Dec. 1.

CARTHAGE, TENN.—The Smith County Electric Company, recently organized with a capital stock of $20,000, is planning to build an electric-light and power plant; also contemplates the construction of an ice factory and cold storage plant. The plant will also serve South Carthage. T. B. Read, L. B. Flippen and others are interested.

MEMPHIS, TENN.—Bids will be received by the Board of City Commissioners of Memphis until Nov. 14 for the purchase of $1,500,000 in bonds, the proceeds to be used for the construction of a municipal electric-light plant.

MEMPHIS, TENN.—An appropriation of $1.500 has been made by the County Court for the installation of a power plant at the Shelby County Industrial and Training School, located near Ellendale. The cost of the equipment is estimated at about $2,000.

VICKSBURG, MISS.—The Vicksburg Light & Traction Company is contemplating the installation of one 15,000-kw. turbo-generator complete with condenser, and one 2000-hp. open type heater. O. H. Simonds is manager.

COTTER, ARK.—The Baxter Electric Utilities Company of Cotter has been granted a 25-year franchise to install and operate an electric-light plant here. The equipment will include a 50-kw. oil engine-driven unit and a 100-kw. steam turbine. The plant will serve the towns of Cotter, Cassville and Mountain Home. L. J. Goodrich is superintendent.

WALNUT RIDGE, ARK.—The Council has decided to install a sewer system, water-works, etc., in sewer district No. 1, which will include sewage pumping station, etc. Equipment will be required for water-works station, including two 300-gal. per minute motor-driven triple pumps, one 50-hp. oil engine, electric generators, etc. Hiram Phillips of St. Louis, Mo., is engineer.

OKLAHOMA CITY, OKLA.—Plans are being prepared by the Blue River Power Company for the construction of a hydro-electric plant. Actual construction work probably will not begin until next spring. William Lucas of Tishomingo is president.

STROUD, OKLA.—Plans are being prepared for improvements to electric-light, water-works and sewer system, to cost about $30,000.

YALE, OKLA.—An election will soon be held to vote on the proposal to issue $25,000 in bonds for installation of an electric light plant and water-works system.

DALLAS, TEX.—The City Commission has increased the rate for tax apportionment for the street-lighting fund, making available $13,000 for the installation of additional lamps.

HUBBARD, TEX.—The Union Central Light & Power Company would like to receive prices for Northern and Western cedar poles, 30 to 40 ft. long, 7 to 8-in. top butts, creosoted, in car lots delivered at Hubbard, 30,000 ft. No. 10 weatherproof insulated copper wire, switchboards, oil switches, automatic electric cut-in and cut-out high and low water-alarm signal devices, volt and ampere meters, switchboard devices and equipment.

SAN SABA, TEX.—A new 100-hp. engine will be installed in the local electric-light plant owned by Frank Hall and associates.

THORNTON, TEX.—Plans are being considered by the Thornton Business Club for the establishment of an electric-light plant and ice factory.

Pacific States

BELLINGHAM, WASH.—Orders, it is understood, will soon be placed by the Morrison Mill Company of Bellingham for electrical equipment, consisting of a 340-kw. generator and individual motors, to be directly connected to each machine, to be installed in the new box factory now being built by the company in Bellingham. Archie Morrison is general manager.

CEDARDALE, WASH.—The residents of the town of Cedardale have petitioned the Puget Sound Traction, Light & Power Company to extend its transmission line from Mount Vernon to Cedardale, a distance of 3 miles, to supply electrical service here.

INDEX, WASH.—An agreement has been entered into between the Index-Galena Company and the City Council whereby the company will supply electricity for lighting the city for a period of five years. Under the new arrangements the poles will be owned and used jointly by the town and the company and at the end of the contract will become the property of the town.

SHELTON, WASH.—The property of the Shelton Light & Power Company has been purchased by William C. Berger and T. E. Donaldson, formerly connected with the Elma (Wash.) Light & Power Company, which has gone out of business.

ASTORIA, ORE.—The United States Government, it is reported, has appropriated $5.000 for the installation of a steam heating and electric-lighting plant in the old gunboat Concord, which has been assigned as a detention barracks at the Astoria Quarantine Station, to supply light and heat to both the Concord and the Quarantine Station.

NORTH BEND, ORE.—The Oregon Power Comany has been authorized to erect a new 11,000-volt transmission line between the C. A. Smith Mill and the company's substation at Porter. The installation will include eight transformers and cost of line is estimated at about $18,000.

OREGON CITY, ORE.—The Portland Railway, Light & Power Company has applied to the City Council for a franchise to install and maintain an electric transmission line along Third Street in Oregon City.

FRESNO, CAL.—Work has begun on the construction of a hydroelectric power plant in Crane Valley by the San Joaquin Light & Power Company of Fresno. The cost of the proposed plant is estimated at $350,000, and, it is expected, will be completed by June, 1917. A. S. Kalenborn, electric engineer of the company, will have charge of the work.

HALF MOON BAY, CAL.—The Half Moon Bay Light & Power Company has applied to the State Railroad Commission for permission to sell its property, consisting of 24 miles of 11,000-volt transmission lines and about 12 miles of distribution lines, to the Great Western Power Company, for $42,500.

LOS ANGELES, CAL.—Bids will be received by the Harbor Commissioners, Los Angeles, until Nov. 1 for electrical work in the municipal warehouse at San Pedro Harbor. C. H. Matson is secretary.

LOS ANGELES, CAL.—Bids will be received by the Board of Supervisors of the county of Los Angeles until Nov. 6 for the installation of an electrical system in the various buildings to be erected on the grounds of Los Angeles County Hospital as follows: service building, the five tuberculosis wards proper, power house and tunnels, maternity building and dining room building. Plans and specifications are on file in the office of the Board of Supervisors. H. J. Lelande is county clerk.

PORTOLA, CAL.—The owners of the Walker Copper Mine, 25 miles from Portola, are contemplating the construction of a large power plant. Application has been made to the State Water Commission to divert 20 cu. ft. of water per second from Nye and Ward Creeks, the power to be utilized to generate electricity to operate the mill and mine. It is proposed to develop 1165 hp.

SALINAS, CAL.—The installation of an ornamental street-lighting system in Salinas is under consideration.

SAN FRANCISCO, CAL.—Surveys are being made by the Great Western Power Company for the proposed plant at Belden. Only preliminary work will be done this fall.

TERRA BELLA, CAL.—Bids will be received until Nov. 13 by the board of directors of the Terra Bella irrigation system district, Terra Bella, for the construction of the first unit of the proposed irrigation system, consisting of 16 wells and well-pumping plants, five main and boosting pumping plants, requiring four 8-in. and two 12-in. centrifugal pumps, two 25-hp. and two 75-hp. motors, two 120-hp. Diesel engines and about 40 miles of 4-in. to 30-in. pipe lines. Plans and specifications may be obtained at the above office or at the office of Stephen E. Kieffer, 57 Post Street, San Francisco, upon deposit of $50, of which $40 will be refunded upon return of plans. Bonds to the amount of $1,000,000 have been voted and a block of $600,000 will be sold to provide funds for the installation of this unit.

WEAVERVILLE, CAL.—The Western States Gas & Electric Company of Stockton has applied to the Board of Supervisors for a 50-year franchise to erect and maintain electric transmission lines over the roads and highways of Trinity County. Bids will be received by the commissioners until Jan. 4, 1917, for the above franchise.

WEAVERVILLE, CAL.—The Northern California Power Company of San Francisco has taken an option for five years on the property of the Weaverville Electric Company and will extend its transmission lines to Weaverville and possibly to Junction City, where connection will be made with the lines of the Western States Power Company that serves Eureka.

SANDPOINT, IDAHO.—The Idaho Power & Concentrating Company, which has developed a water power at Trestle Creek, is seeking a franchise to supply electricity for lamps and motors in Sandpoint.

SALT LAKE CITY, UTAH.—Preparations are being made for equipping Saltair railroad for electrical operation. The work will include an extension from the salt plant near Saltair Beach to Garfield, which will involve the construction of an entirely new road; a good part of the present road will be double-tracked. Arrangements have been made to secure energy from the Utah Power & Light Company.

GREAT FALLS, MONT.—Work is under way now on the Rainbow dam plant of the Montana Power Company, one of the three now operating at Great Falls, which will increase the output of this plant by 13,000 hp. This makes a total developed horse power of 158,000 and less than half of that available for future development at this place. This improvement will cost approximately $500,000 and will be directly in charge of Charles T. Main Company of Boston, Mass. A. J. Breitenstein is secretary.

THREE FORKS, MONT.—The Council has awarded the Montana Power Company a contract for street-lighting in Three Forks.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing agent, the Panama Canal Commission, Washington, D. C., until Nov. 10 for furnishing steel spring plates, steel and iron castings, cable, wire, sheet copper, sheet brass, bronze, brass tubing, cable clips, grease cups, oil cups, engine lubricators, steam gages, steam whistles, gage lamps, gaskets, rubber valves, vacuum cleaners, flexible conduit, trolley poles and equipment, pipe covering, etc. Blanks and general information relating to this circular (No. 1094) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building New Orleans, La., and Fort Mason, San Francisco, Cal.

1,201,241. Signal Controlling Device; J. Berg, New York, N. Y. App. filed April 1, 1915. Susceptible to the action of rain, fire and the like.

1,201,255. Compression Rheostat; E. L. Clark, Lakewood, Ohio. App. filed March 31, 1913. Rapid cooling of resistance elements obtained.

1,201,270. Oscillating Current Generator; L. DeForest, New York, N. Y. App. filed Sept. 14, 1914. Increase in oscillation energy of currents generated.

1,201,271. Oscillation Audion; L. DeForest, New York, N. Y. App. filed July 22, 1915. May be used as a generator of high-power oscillating energy and withstand excessive heat.

1,201,272. Telegraph and Telephone Receiving System; L. DeForest, New York, N. Y. App. filed Sept. 27, 1915. Renders it possible to use dynamo or large current supply mains in the wing circuit of the audion in receiving station.

1,201,273. Oscillation Generator; L. DeForest, New York, N. Y. App. filed May 13, 1915. Capable of generating oscillating, alternating or pulsating currents of substantially uniform amplitude.

1,201,295. Insulator Support; L. E. Hendee, Milwaukee, Wis. App. filed July 29, 1913. Bracket of cast iron and a steel screw for detachably securing the bracket to support.

1,201,314. Door-Controlled Electric Switch; O. Kreter, San Antonio, Tex. App. filed Jan. 28, 1916. Improved switch attachment automatically operated by door movement.

1,201,321. Trolley Wire Guard; W. D. McCausland, Pittsburgh, Pa. App. filed Feb. 3, 1915. For use in mines, etc., for protecting persons and animals from injury by preventing coming in contact with wires.

1,201,325. Insulator; H. R. Markel, Columbus, Ohio. App. filed Dec. 26, 1913. Primarily for house wiring adapted to support wire a predetermined distance from the wall.

1,201,343. Telephone Transmitter; S. C. Porter, New York, N. Y. App. filed Jan. 18, 1915. Concentrating passage leading to diaphragm to collect sounds from great distances to be reproduced at receiving end.

1,201,362. Dental Engine Hand Tool; W. G. Shelton, New York, N. Y. App. filed April 18, 1911. Self-contained dental engine hand tool.

1,201,363. Self-Contained Engine Hand Tool; W. G. Shelton, New York, N. Y. App. filed March 17, 1913. Drill stock carrying self-contained engine constituting a hand tool.

1,201,365. Dental Hand Engine; W. G. Shelton, New York, N. Y. App. filed April 4, 1914. Compact and well-balanced hand tool with electric motor within, and means for controlling same.

1,201,366. Electric Switch; W. G. Shelton, New York, N. Y. App. filed April 6, 1915. For use in connection with portable electric engines to control speed by frequent regulations.

1,201,379. Apparatus for the Production of Ozone; J. Steynis, Bay Shore, N. Y. App. filed March 9, 1915. By means of electrical discharges which act upon air.

1,201,380. Apparatus for Producing Ozone; J. Steynis, Bay Shore, N. Y. App. filed March 11, 1915. In large quantities more economically and efficiently than heretofore.

1,201,384. Switch for Electric Circuits; B. P. Swyers, Pittsburgh, Pa. App. filed Jan. 27, 1914. Of high-tension type, capable of operation only when combination is previously known.

1,201,390. Automobile Lock; G. A. Theobald, Boston, Mass. App. filed Jan. 10, 1914. Automatic brake lock to prevent automobile from being stolen.

1,201,418. End Cell Switch; J. W. Achard, Philadelphia, Pa. App. filed Nov. 2, 1911. Resistances employed to prevent opening of circuit when member travels from one contact to another.

1,201,424. End Cell Switch; C. Ambruster, Roslyn, Pa. App. filed June 30, 1913. For reducing sparkling which sometimes occurs in moving brush.

1,201,455. Telephone Exchange System; C. L. Goodrum, New York, N. Y. App. filed Dec. 12, 1914. Providing means for calling subscriber by either old or new number.

1,201,479. Primary Battery; E. McGall, Orange, N. J. App. filed July 27, 1914. Improved form of positive element affording increased circulation of electrolyte and diffusion of particles therein.

Record of Electrical Patents

Notes on United States Patents issued Oct. 17, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,201,480. Primary Battery; E. McGall, Orange, N. J.—App. filed Sept. 14, 1915. Improved negative electrode composed of oxide of copper having homogeneous coating of conductive metal.

1,201,481. Galvanic Battery; E. McGall, Orange, and M. D. Malcomson, West Orange, N. J. App. filed Aug. 12, 1914. Improved electrolyte in colloidal state affording increased capacity and rate of discharge.

1,201,482. Automobile Signal; E. C. McKenzie and J. P. Dever, Toledo, Ohio. App. filed Nov. 22, 1915. Means for signaling front or rear of intention to change direction of travel.

1,201,491. Electromagnetic Device; W. C. Neahr, Denver, Col. App. filed May 22, 1915. For alternating current providing structure readily assembled.

1,201,504. Code Impulse Signaling System; J. G. Roberts, Dobbs Ferry, N. Y. App. filed July 12, 1913. For rapid transmission in telephone system.

1,201,509. Police Alarm; S. F. Schooley, McAlester, Okla. App. filed July 28, 1915. Electrically operated to indicate at central station when house, vault, etc., are entered or wires are cut.

1,201,512. Dynamo Electric Machine; C. E. Search, Milwaukee, Wis. App. filed Oct. 4, 1911. For receiving collector, leads of rotary field winding with collector wings of machine.

1,201,516. Lamp Jack; C. H. Smith, Chicago, Ill. App. filed Dec. 3, 1914. Improved construction having means for guiding lamps into jack springs.

1,201,526. Automatic Safety System for Electrolyzers; H. R. Swartley, Jr., Great Neck, and L. Larsen, Brooklyn, N. Y. App. filed July 21, 1916. Which prevent the electrolyzers from operating under improper condition and also prevent discharging.

1,201,530. Vapor Electric Apparatus; P. H. Thomas, Upper Montclair, N. J. App. filed Sept. 12, 1912. Mercury vapor device to be operated on constant current circuit.

1,201,541. Method of Obtaining Titanic Oxid; L. E. Barton, Niagara Falls, N. Y. App. filed March 7, 1916. From titaniferous substances such as elmenite ores; novel steps in practice of such methods.

1,201,550. Flashlight; F. W. Brush, Winthrop, Mass. App. filed Sept. 22, 1915. For use of dentists in illuminating the interior of human mouth.

1,201,564. Signal Mechanism for Vehicles; P. U. Daniel, Buffalo, N. Y. App. filed April 11, 1916. Automatically lights rear signal lamps at predetermined speeds.

1,201,569. Telephone System; E. D. Fales, Chicago, Ill. App. filed May 7, 1907. Provision made for automatically selecting trunks or trunk line or other suitable connections.

1,201,585. Electropneumatic Organ Valve; R. Hope-Jones, North Tonawanda, N. Y. App. filed July 15, 1910. So employed to be used as primary valve for speaking of various organ pipes.

1,201,600. Telephone Trunking System; T. G. Martin, Chicago, Ill. App. filed Sept. 28, 1907. In which trunking service may be required between two or more of the exchanges in system.

1,201,603. Sliding Bow and Rotating Brush for Electrically Driven Vehicles; Gottfried Meyer, Zurich, Switzerland. App. filed Nov. 3, 1914. Relates to trolley poles or bows wherein positively guided weights are provided to maintain collector against wire.

1,201,607. Electric Furnace; I. Moscícke, Lemberg, Austria-Hungary. App. filed May 29, 1913. Of flaming type supplied by alternating current providing furnace wherein gas surges have no detrimental effect.

1,201,610. Protective System for Electrical Transmission Lines; L. C. Nicholson, Buffalo, N. Y. App. filed Jan. 26, 1912. Automatic switch capable of closing quickly through long air-gap of high-voltage system.

1,201,611. Process for Manufacturing Metallic Filaments for Incandescent Electric Lamps and for Other Purposes; Kwan Nishimoto, Tokyo, Japan. App. filed May 21, 1915. Cold-drawn metallic filaments for lamps.

1,201,619. Apparatus for Controlling the Energy Supply for Peak Demands; K. A. Pauly, Schenectady, N. Y. App. filed July 31, 1914. Maintaining the average demand of installation below predetermined value.

1,201,621. Means for Synchronizing Telegraphic and Other Apparatus; L. M. Potts, Baltimore, Md. App. filed April 30, 1913. Means for effecting synchronous motion between moving parts located at a distance from each other.

1,201,639. Electric Meter; K. Schmiedel, Charlottenburg, Germany. App. filed Dec. 7, 1914. Induction type having short-circuited winding for producing angle of phase displacement of torque producing potential and current fluxes.

1,201,646. Protective Device; C. P. Steinmetz, Schenectady, N. Y. App. filed April 21, 1916. Of lightning-arrester type for short-circuiting arrester when heat generated becomes excessive.

1,201,661. Protective Means for Alternating-Current Distribution Systems; E. B. Wedmore, Golders Green, England. App. filed Dec. 24, 1915. For disconnecting portion of system in event of a fault to earth, etc.

1,201,671. Induction Furnace; J. R. Wyatt, Philadelphia, Pa. App. filed Jan. 24, 1916. To apply motor effect of induced currents flowing in opposite directions close together and at acute angle for stirring of pool.

1,201,687. Current Transforming Device; A. R. Bullock, Cleveland, Ohio. App. filed March 7, 1911. By mechanical means converts currents of one characteristic to that of another; adapted to rectify alternating current.

1,201,694. Heating Device; C. M. Carpenter, Branden, Vt. App. filed March 4, 1916. For cooking purposes whereby device used in operative position with convenience and facility.

1,201,702. Interrupter for Ringing Circuits; H. D. Currier, Chicago, Ill. App. filed Nov. 19, 1914. For telephone circuits providing one or more interrupter circuits.

1,201,707. Liquid Rheostat; G. H. Dorgeloh, Schenectady, N. Y. App. filed July 30, 1914. Affording low final resistance and good range between final and initial positions; applicable to induction motors.

1,201,709. Electric Cell; C. Fery, Paris, France. App. filed March 6, 1916. Improved type of cell.

1,201,738. Method and Apparatus for Shaping Filaments; J. W. Janvier, Newark, N. J. App. filed Jan. 27, 1914. Particularly applicable to tungsten. Filaments accurately shaped in a definite predetermined form.

1,201,746. Lamp Socket Fixture; F. A. Lavercombe, Newport, Ky. App. filed March 4, 1915. Novel fastening means for securing sockets to wall and ceiling.

1,201,771. Conduit Outlet Box and Fixture Therefor; E. G. Smith, Syracuse, N. Y. App. filed Aug. 7, 1911. Particularly applicable in railway cars for supporting electric lamps.

1,201,782. Electric Connector; E. B. Wilcox, Meriden, Conn. App. filed Oct. 14, 1915. Form of plug connection to be used interchangeably in either one-wire grounded, or two-wire systems.

1,201,783. Electric Connector; E. B. Wilcox, Meriden, Conn. App. filed Oct. 14, 1915. Connection to be used in sockets of either one-wire grounded or two-wire all insulated systems of electrical distribution.

1,201,784. Electric Connector; E. B. Wilcox, Meriden, Conn. App. filed Oct. 14, 1915. Plug adapted for application in one-wire type socket and to enable ready displacement of grounding connection when plug is used in socket of two-wire all insulated type.

1,201,797. Telephone System; S. A. Beyland, Elyria, Ohio. App. filed Jan. 3, 1911. Means for giving distinctive signal in systems which employ reverting busy testing circuit.